IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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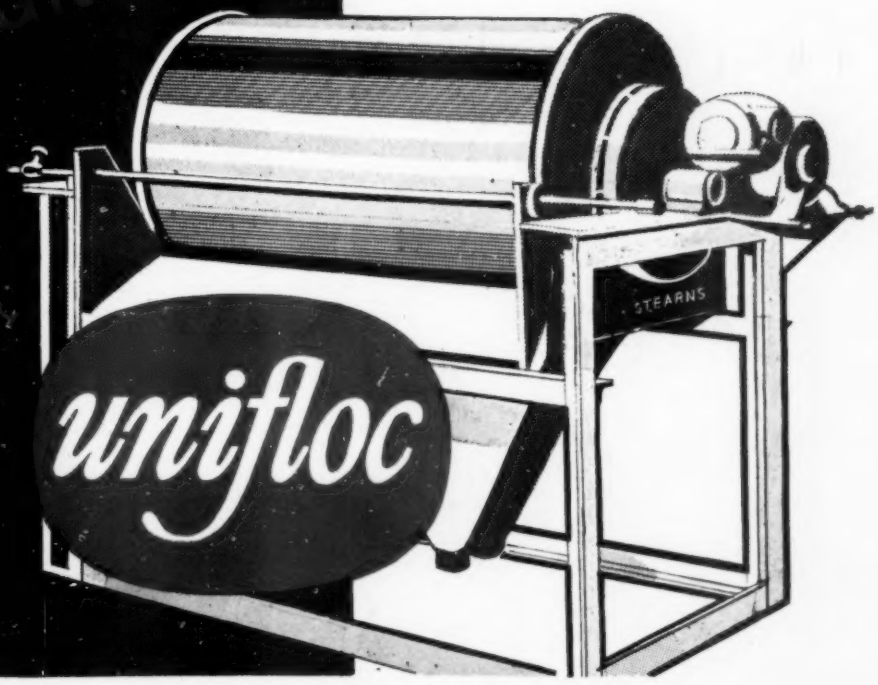
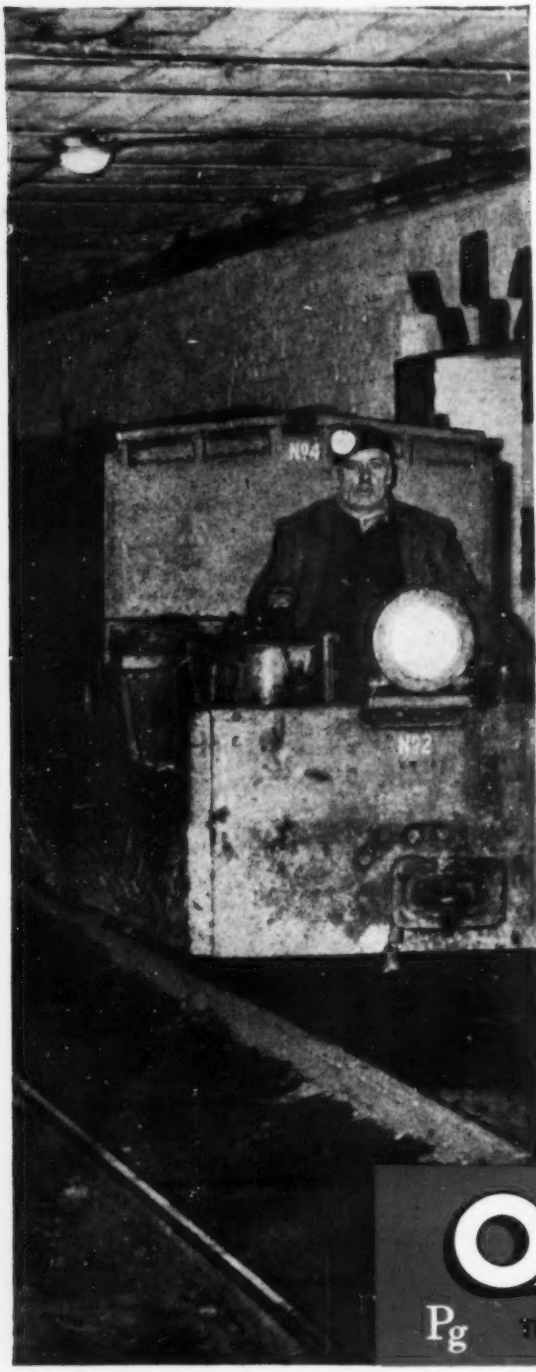
THE MACHINE WITHOUT AN EQUAL FOR "MAGNETITE" RECOVERY



'UNIFLOC/STEARNS' PERMANENT MAGNET DRUM SEPARATOR

UNIFLOC LIMITED SWANSEA



Pg*

MEANS CHEAPER HAULAGE —LONGER SHIFTS

with the first and only 'Double-Sleeve' Long-Life Battery

Until now, many mines have been unable to take full advantage of battery-electric haulage. Today, since the introduction of the greatly advanced Oldham 'Pg' battery, they have gained the double benefit of cheaper haulage and longer battery shifts.

Greater Capacity. Where an ordinary battery is incapable of lasting the necessary period, the exceptionally efficient power/weight ratio of the Oldham 'Pg' battery enables it to work a complete shift without tiring and often continue beyond if required. This greater capacity is due to the much bigger quantity of active material packed into the 'Pg' plate.

Longer Life. The 'Pg' plate incorporates woven glass fibre sleeves, into which the active material becomes firmly embedded, completely eliminating 'shedding'. In addition, physical working stresses are absorbed by the exclusive 'Pg' outer plastic sleeve. These two factors both contribute to the very long working life of the Oldham 'Pg' battery. If you are facing a haulage problem now, or anticipate one, ring or write to us and arrange for an Oldham consultant to call and discuss how 'Pg' can help you.

'Pg' Cap Lamp Battery. The advantages of 'Pg' have been applied to the 'Oldham 'Cap Lamp. In addition to improved efficiency and longer life, 'Pg' means *safer* working, as it gives the wearer brighter light at the end of the shift, when accidents are more likely to occur through fatigue.

'I told 'em—OLDHAM'

OLDHAM

Pg TRACTION BATTERIES

***'Pg' also means PLASTIC-plus-GLASS, the first and only 'Double-Sleeve' tubular battery plate.**

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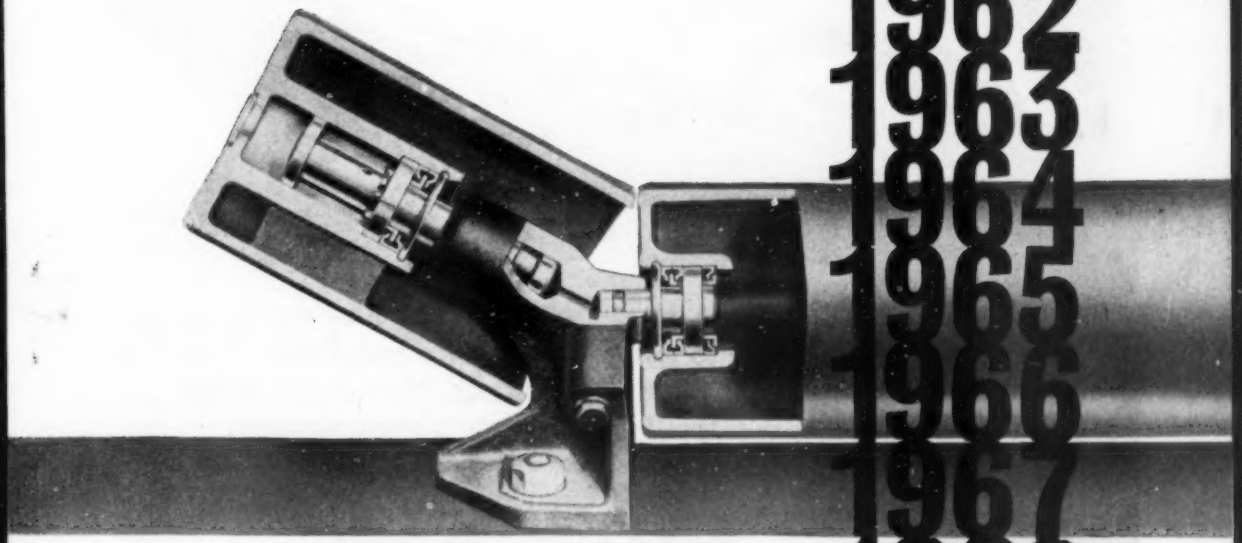

M&C belt conveyor idlers come from the works perpetually sealed against even the smallest particles of grit. That is one reason why after twenty years or more of hard work many of them still spin at a touch.

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THE BONSER HYDRAULIC RAM

A HYDRAULIC RAM built
to give reliable service under the
worst pit conditions. Material and design
specifications of the highest standard.
Total Thrust 3·15 Tons at 1000 PSI
Piston 2″ Diameter
Tube 3″ inside, wall thickness $\frac{1}{4}$″

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STEEL AGE IN MINIATURE

Steel is the sinews of bridges and skyscrapers. But it is just as essential when things have to be made very small. It can be formed very accurately into shapes of insect-like delicacy, yet still retain the proverbial strength of steel.

Nowadays more and more things are tending to shrink in size. This is sometimes the result of new technical requirements: the midget ball-race shown above is typical of the tiny parts used in space vehicles.

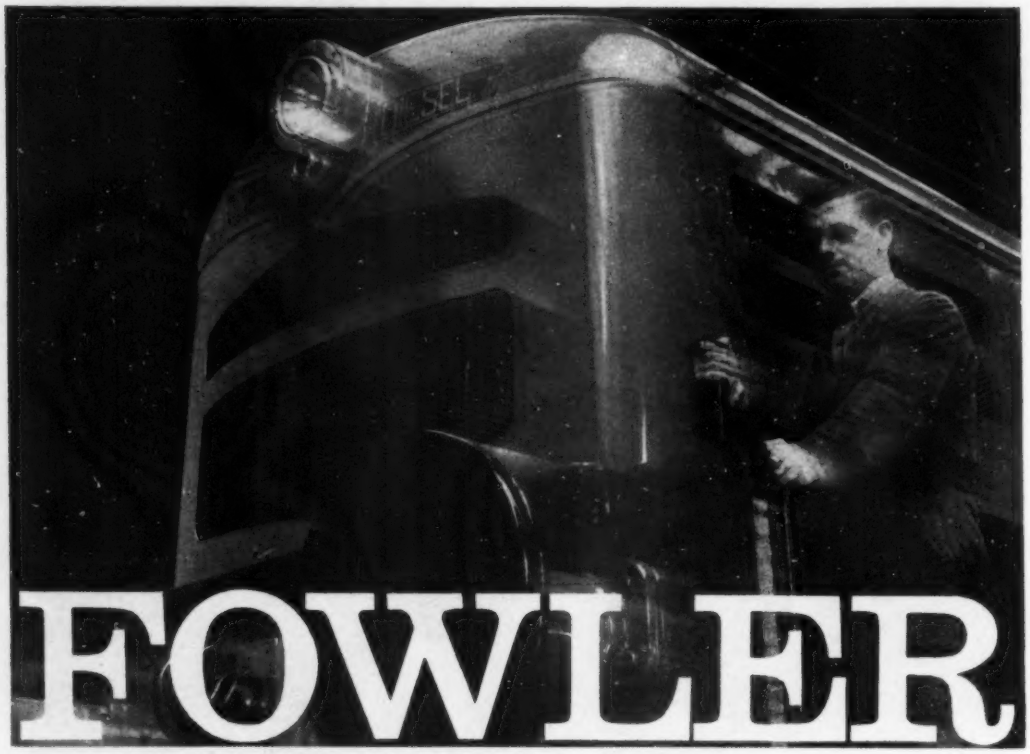
Steel has many advantages for small-scale work. It can be shaped while relatively soft, and then hardened. It comes in almost any required combination of springiness, toughness or stretchability. Whether you are making a 1000 foot television mast or a screw 1/25th inch long, steel is the best material for the job.

1 Ball-race, 4 mm. in diameter
2 Watch escape wheel
3 Countersunk watch screw 1·05 mm. long
4 Intermediate wheel from watch
5 Watch escapement lever
6 Hairspring from watch
7 Steel balls 0·5 mm. in diameter
8 Balance staff of watch
9 Stainless steel wire 0·0015" in diameter
10 Match head to show scale

Items 1 and 7 supplied by British Manufactured Bearings Co. Ltd. Items 2, 4, 5, 6, 8 supplied by H. Samuel Ltd. Item 3 supplied by Anglo-Swiss Screw Co. Ltd. Item 9 supplied by Samuel Fox and Co. Ltd.

THIS IS THE STEEL AGE

BRITISH IRON AND STEEL FEDERATION



FOWLER

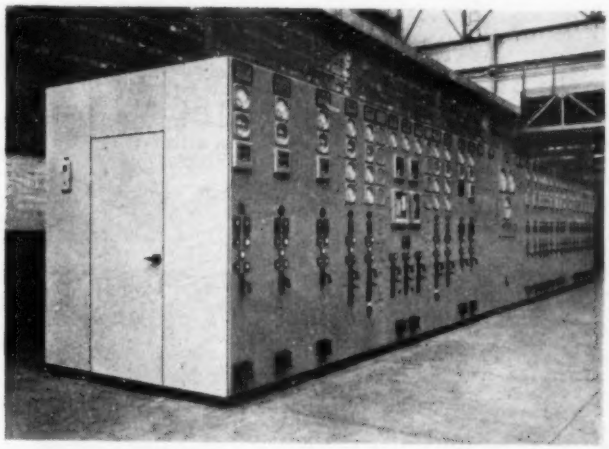
MEANS FASTER HANDLING

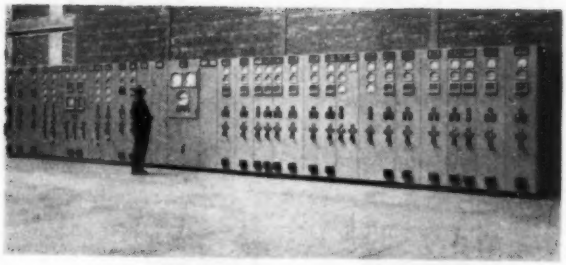
Every day, seven days a week, this Fowler diesel at the Elland Power Station shunts 400 trucks and 2,200 tons of coal. Using only 40 gallons of fuel each week, it stops for refuelling once in ten days. In over a year's continuous operation, it has never been withdrawn for servicing—requiring only simple, routine maintenance. Fowler diesels are never standing idle. They are always on the move, earning their keep right round the clock.

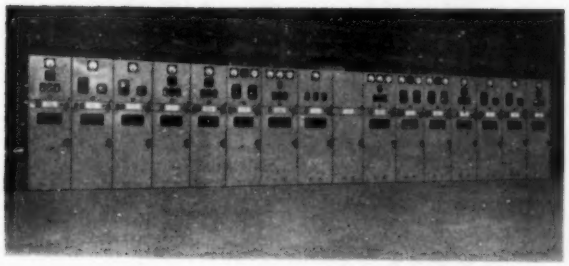
Central Electricity Generating Board's Elland Power Station

JOHN FOWLER & COMPANY (LEEDS) LTD, LEEDS 10 TEL: 30731

NEW PLATE MILL AT CONSETT







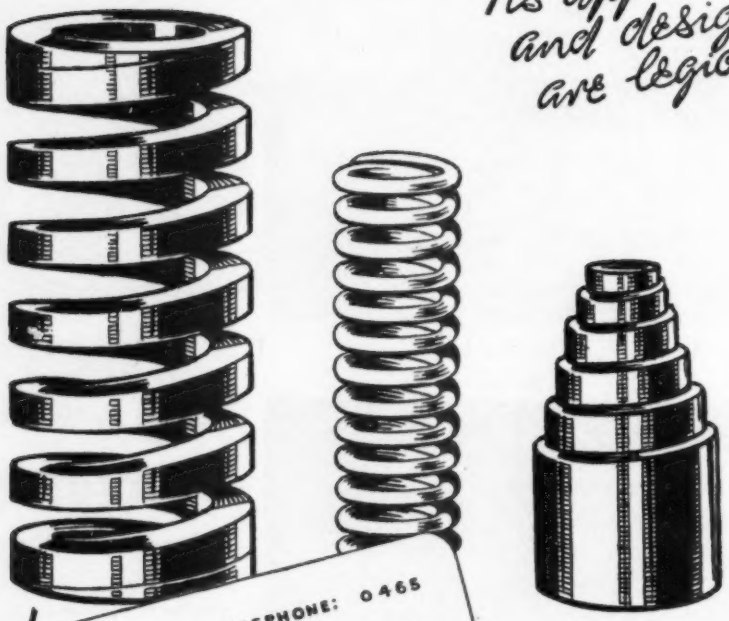
All the main distribution switchgear at the Consett Iron Company's new plate-mill installed at Hownsgill has been supplied by Reyrolle.

It comprises 11-kV 750-MVA and 350-MVA metalclad oil-break and 3·3-kV 150-MVA air-break switchgear, together with its associated control equipment.

Reyrolle

A. Reyrolle & Co. Ltd - Hebburn - County Durham

Its application and design are legion



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Manufacturers of Springs and Spring Pressings of every kind

GEORGE ST., WEST BROMWICH

Simon-Carves do a lot with coal one way and another. Their specialities include skips and mine cars to bring coal to the surface, washeries to clean it, coke oven plants to carbonize it and boiler plants to burn it.

The coke oven by-products are refined in other Simon-Carves plants and pure benzene, toluene and xylene are produced, tar is distilled, naphthalene purified, tar-acids separated and anthracene oils extracted. The hydrogen from coke oven gas is used for production of ammonia in Simon-Carves fertiliser plants.

Coke is used in steelmaking and in sintering, a fact which links with many more Simon-Carves activities — in the ore preparation field, in civil engineering, in building blast furnace and steel plant dust precipitators, sulphur recovery plants and sulphuric acid plants, and so on and so on — ad infinitum (or so it seems).

Where there's industry there's coal and whichever way you look at it, Simon-Carves make the most of coal — and have been doing for seventy-odd years.

Simon-Carves Ltd (SE)

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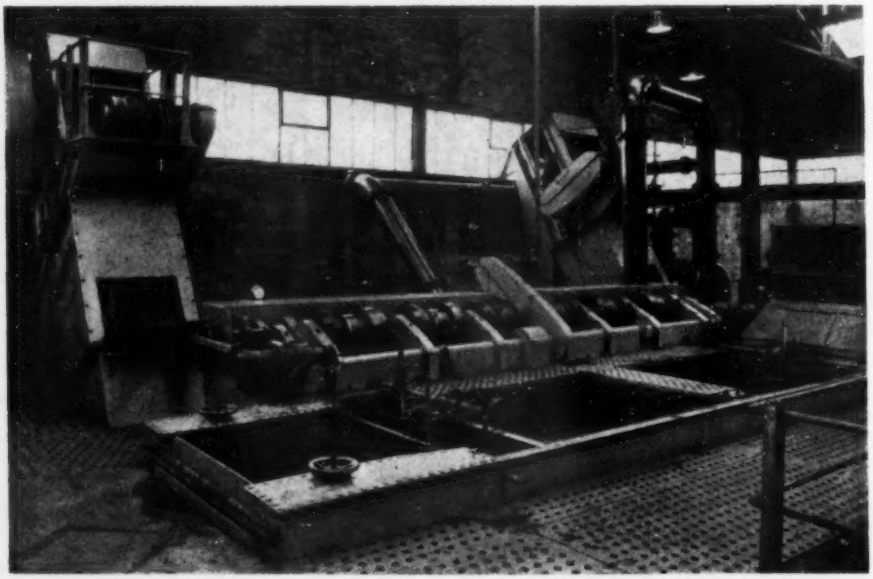
BLANTYRE BAUM WASH BOX INSTALLATIONS

BAUM BOX IN A COMPLETELY NEW INSTALLATION 150 tons per hour 6" to 0" Coal



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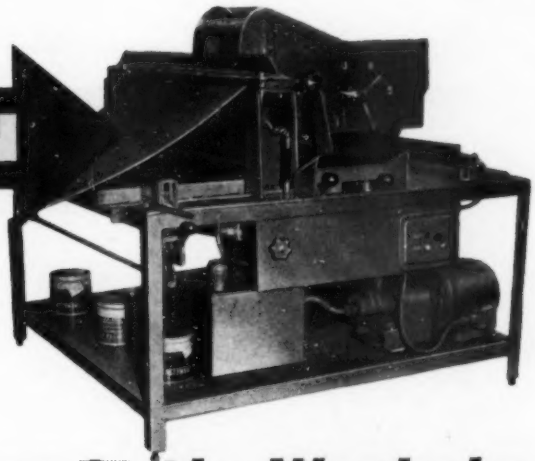
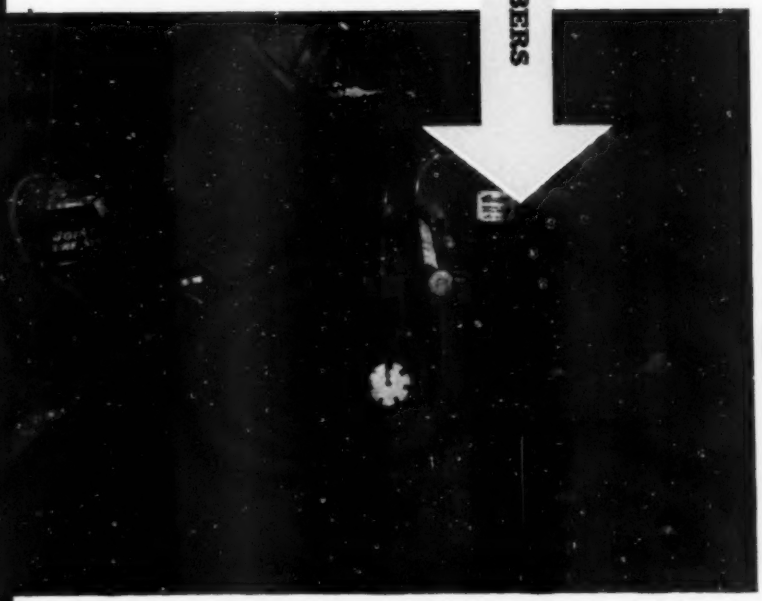
Comet LEVIATHAN

BELT FASTENING BY NUMBERS



Hydraulic Belt lacing Equipment on the face.. ..or in the Workshop



Photograph by courtesy of The National Coal Board

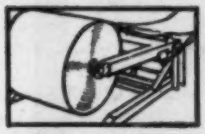
Ease, Speed and Simplicity of operation Belt-end is securely, mechanically held; ensuring perfect alignment of hooks. Hydraulically-operated jaws (adjustable to thickness of belting) ensure perfect clench. A 42" belt takes 5 minutes to joint....calls for *no* effort!

Mechanically Perfect Joint As the hooks are always absolutely in line, and every hook correctly clenched, it is impossible to make anything *but* a perfect joint—which *must* last longer!

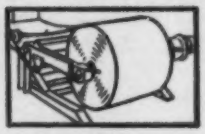
Wide Range 'Leviathan' is versatile. Takes any belt-width from 16" to 42". Any thickness of belt from ¼" to ¾". You can operate the 'Leviathan' a full working week without wasting a single hook!

Eliminates Operator Fatigue Leviathan provides *all* the power needed. The operator only controls it, and is still working as efficiently at the end of the day as during his peak period. Full utilization of machine, lower cost per joint *must* follow.

Complementary Equipment



UNCOILING HEAD Hydraulically operated to lift coil clear of ground.



COILING HEAD Electrically operated, re-coils belting after joint is made.

Every responsible colliery executive will naturally be interested in this latest development and is cordially invited to see it demonstrated at our factory.

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COLLIERY CONVEYOR BELT LACING SYSTEM

MASTABAR MINING EQUIPMENT COMPANY LTD.

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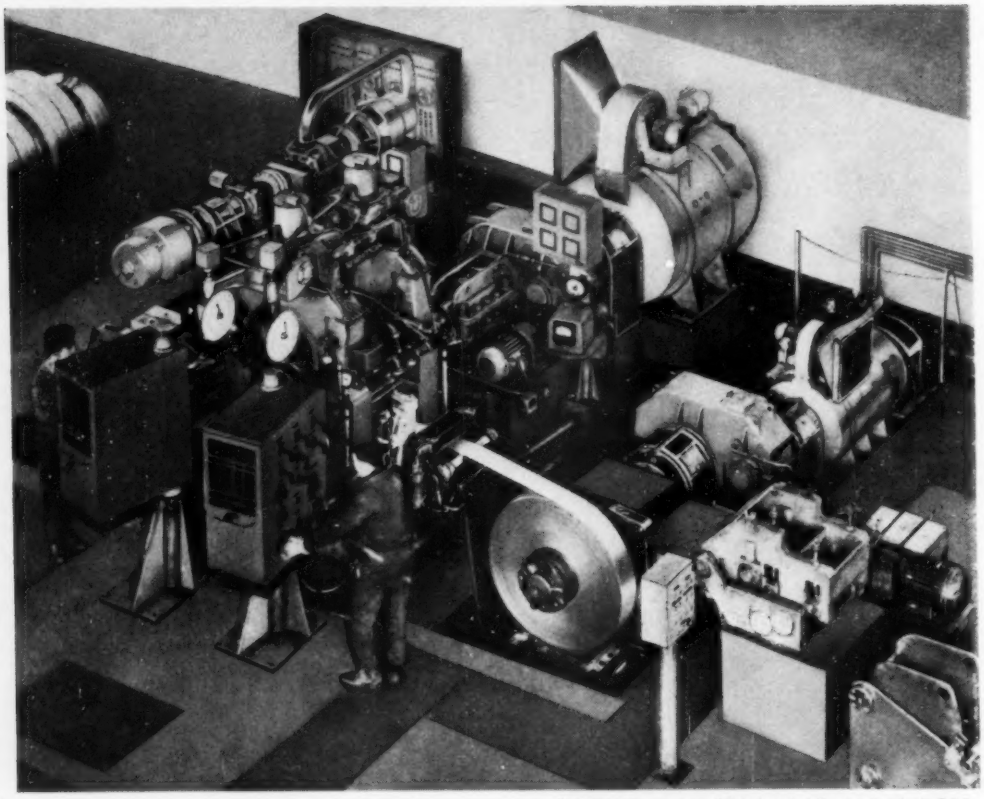
ROBERTSON
in ITALY



Photograph by courtesy of S.A. Acciaiere Ferriere Lombarde Falck.

Four-High Cold Reversing Mill for rolling steel strip.

Built by Robertson and installed at the works of S.A. Acciaiere Ferriere Lombarde Falck, Vobarno.

W. H. A. ROBERTSON & CO. LTD.
BEDFORD • ENGLAND

LICENSEES FOR THE BUILDING OF SENDZIMIR COLD REDUCTION MILLS AND PLANETARY HOT MILLS AND HALLDEN FLYING SHEARS

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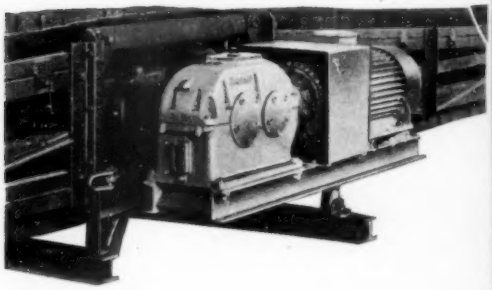
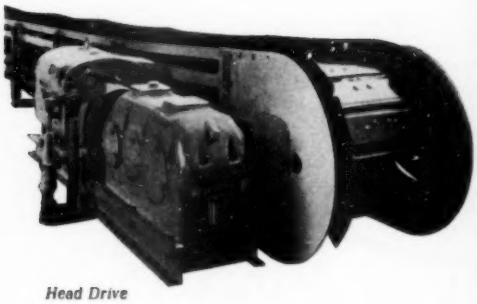
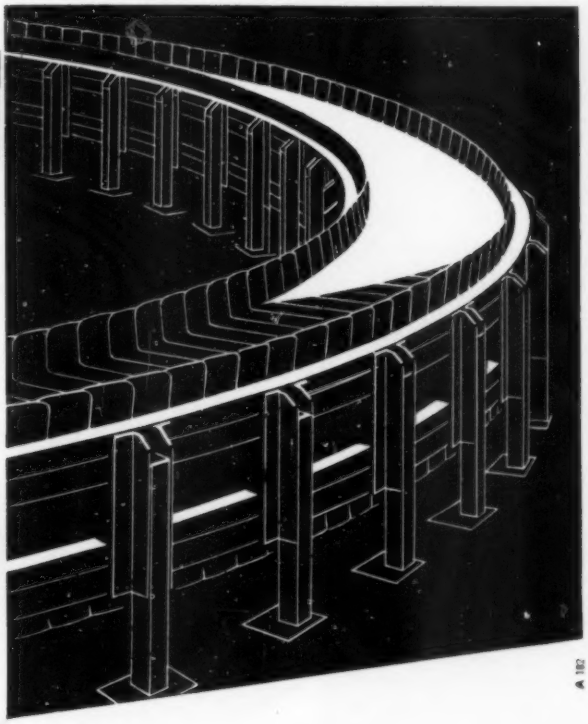


Intermediate Drive



Head Drive



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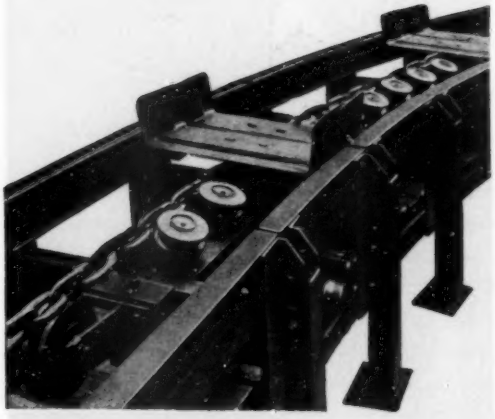

for bends with a 20' radius

Eickhoff

PLATE CONVEYORS

with Round-Link Chains

capable of negotiating bends in road ways with only 20' radius.

Available for widths of 400, 540 and 640 mm.

The Head Drive, Type T, powered by 2 electric motors of 50 HP each is designed for running speeds from 3' to 4'/sec.

By changing the drive sprocket, Type T can also be converted for use with strap-link type chain conveyors.

For trunk conveying 30 HP Intermediate Drives, Type TZ II, can be installed in the line of conveyor. Ingeniously controlled carrier claws are the special feature of the driving chains in the Intermediate Drive (DBP No. 1004545)

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CRAWLEY WILCOX CONTINUOUS MINERS
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MOBILE BUNKER CONVEYORS
EXTENSIBLE STAGE LOADERS
MOBILE STAGE FEEDERS
MOBILE STAGE LOADERS
EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE
COAL BUNKER UNITS

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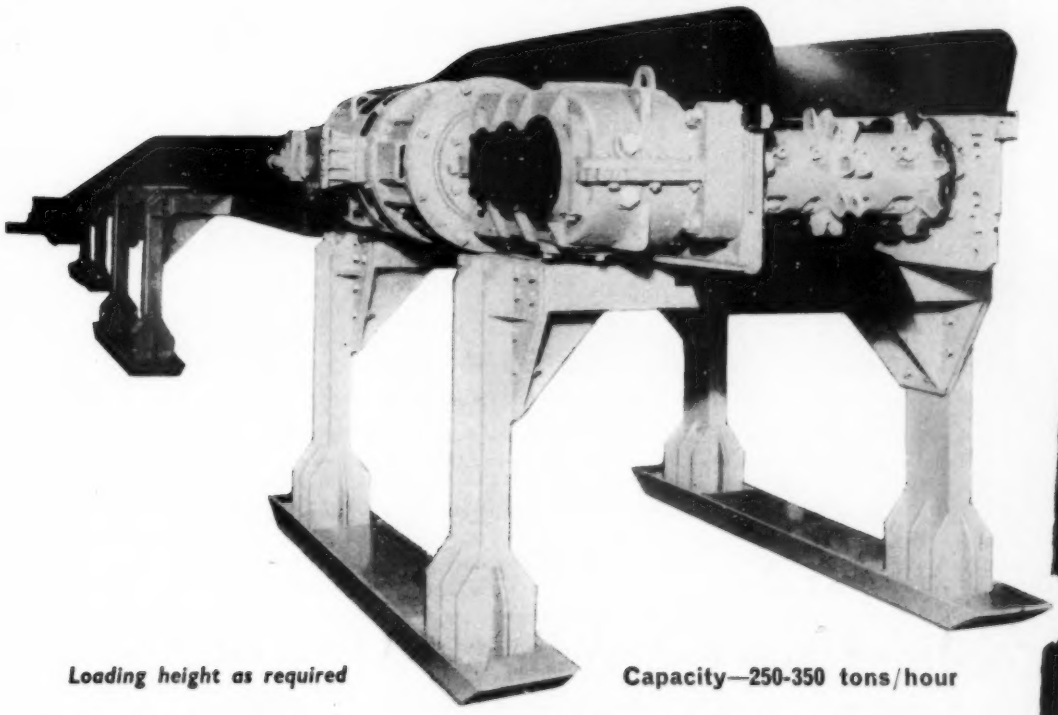
THE CRAWLEY HEAVY DUTY SKID MOUNTED STAGE LOADER



Loading height as required

Capacity—250-350 tons/hour

Overall width—

Extra Heavy Duty Extensible Stage Loader, treble strand 18-mm. chain .. .. 30 in. & 36 in.

Heavy Duty Extensible Stage Loader, double strand 18-mm. chain .. .. 24½ in.

Lo-hite Extensible Stage Loader, double strand 13 or 14-mm. chain .. .. 24½ in., 30 in. & 36 in.

Designed basically to deal with the problem of extension of plate belt conveyors, so that the equipment gives the minimum coverage over the discharge unit, but is extensible by the addition of pans and chains up to an overall length of 150 yards, thus avoiding frequent and expensive extensions to the plate belt conveyor, and can be supplied with N.C.B. recommended drive frame and gear box at request.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

Drive Frame · Gear Box · Gear Assemblies · Extension Sections · Structure · Tail Unit · Chain Flights

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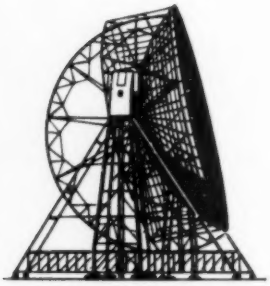
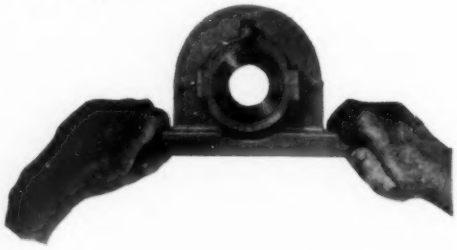
a very important Cooper...



This Cooper Split Bearing is one of two supporting the 250 ft. diameter Paraboloidal Reflector on the gigantic Radio Telescope at Jodrell Bank. Each Cooper is 30" bore and is designed to carry a radial load of 500 tons and a thrust load of 125 tons. Their design is to the same principle as our standard range of Split Bearings which have been manufactured for over 50 years. Some 40 Pedestals in sizes from 4½" bore to 10" bore are used for the Bogie drives and Reflector actuation. Whatever the size of the equipment you are dealing with, Cooper Split Roller Bearings offer **great** advantages. The fact that they are split right down to the shaft frees the designer (no worry about 'how to get the bearings in')—and guarantees simple maintenance.

...another very important Cooper...

The smallest Cooper is 1 3/16" bore. Whilst perhaps having a less spectacular role than those on the Radio Telescope, it can be depended upon to give long years of trouble-free service. Cooper Bearings are made in three standard series—Medium, Heavy and Extra Heavy—and all sizes are complete with self-aligning Housings and Pedestals. Perhaps we should add that prices are competitive, deliveries prompt. May we send you a Catalogue giving full technical details?



COOPER ROLLER BEARINGS

split right down to the shaft

COOPER ROLLER BEARINGS CO. LTD., KING'S LYNN, NORFOLK, ENGLAND · TELEPHONE: KING'S LYNN 3447

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COMPLETE

METHANE

BOREHOLE INSTALLATIONS

AND

AUTOMATIC FIRE PROTECTION EQUIPMENT

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H. LINDLEY LIMITED

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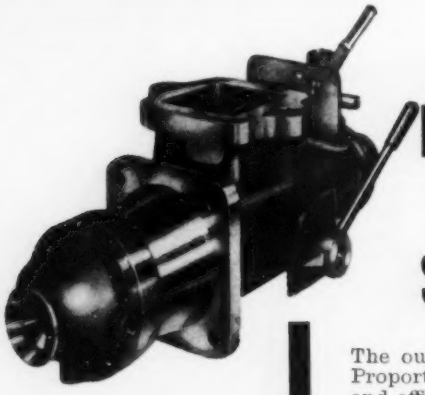

Here is one Oil Burner that brings efficiency SIMPLY to hand

The Burner shown has a maximum output of 12 gallons per hour and requires atomising air at 20" (51 cm) w.g. to 30" (76 cm) w.g. with oil at not less than 5 lbs per sq. in. (0.35 kgs per sq. cm) or equivalent head.

The outcome of 80 years' experience the Wallsend Self-Proportioning Low Air Pressure Oil Burner brings new ease and efficiency of control to oil burning. The single lever at the side automatically proportions oil and air quantities in the correct ratio and whatever the type of fuel.
It has, too, a turn down range of approximately 5 : 1 which can be achieved with a stable flame, efficient combustion and a high CO_2 content. Made with the well known Wallsend features of robustness, long service with little maintenance, and flexibility this outstanding burner leads the way, as well, to automatic or remote control of all single and multi-burner installations . . .

THE WALLSEND SELF-PROPORTIONING LOW AIR PRESSURE BURNER

For more efficient OIL BURNING consult

THE WALLSEND SLIPWAY & ENGINEERING COMPANY LIMITED

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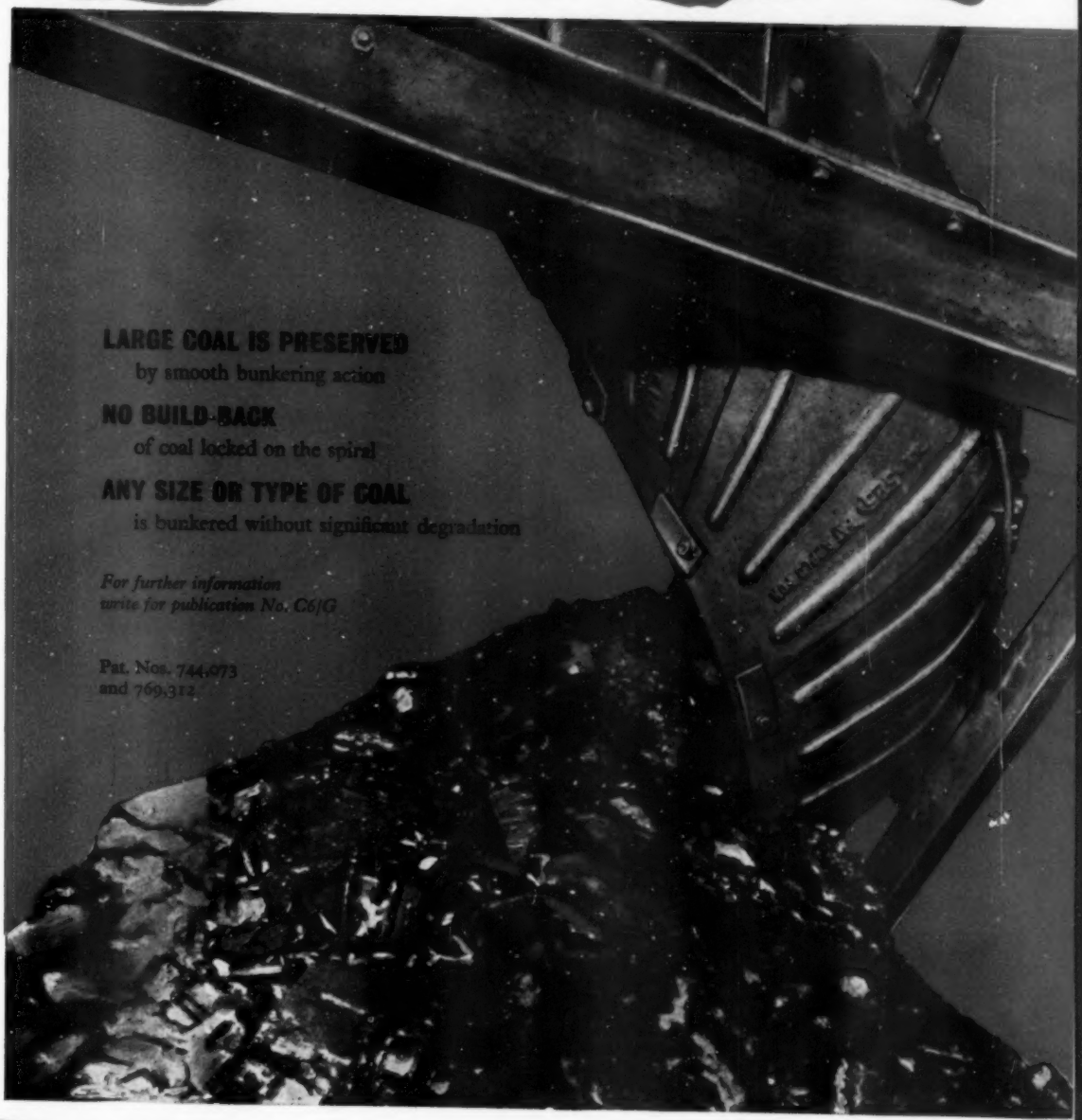
Efficient bunkering – by QH Spiral Chutes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by smooth bunkering action
NO BUILD-BACK
of coal locked on the spiral
ANY SIZE OR TYPE OF COAL
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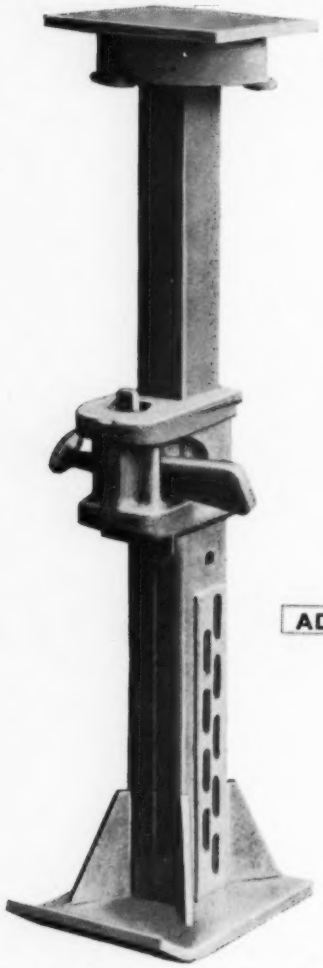

FEATURES

Tapered upper member to ensure reliable support.

Single clamping wedge.

Robust construction.

Swivelling head—detachable from a standard pronged head by easy twist/lift action.

Setting wedge insertion without prior hand lifting of upper member.

USES

In temporary rib side loading gates of mechanised faces.

As stiffening-up supports on conventional or mechanised faces.

ADVANTAGES

Easily set and withdrawn.

Reliable acceptance of load.

Considerable savings compared with the use of timber chocks. Also the use of timber packing pieces is unnecessary.

Years of constant use without maintenance.

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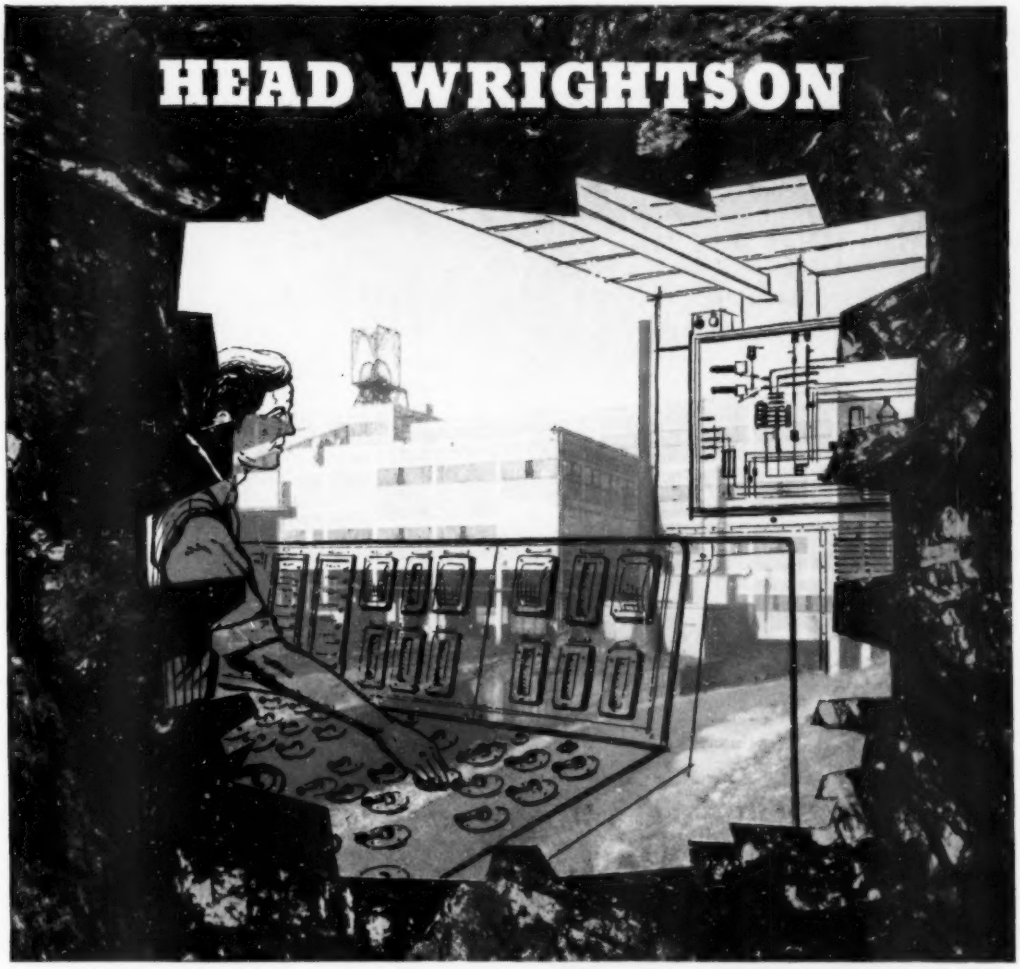

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Our extensive experience in all fields of colliery engineering enables us to offer a comprehensive service for the design and construction of complete colliery surface plant. The central Research and Development Division of the Head Wrightson Group gives full support to our constant endeavour to improve plant and equipment design and to secure the maximum automatic control within the Plant.

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COAL PREPARATION • CYCLONE WASHING FOR COAL AND MINERALS • STRIPA PROCESS

HEAD WRIGHTSON MINERALS ENGINEERING LIMITED

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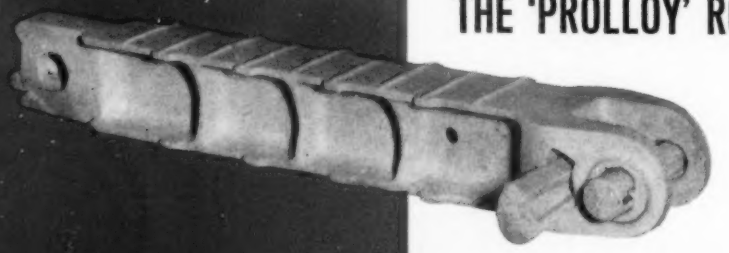
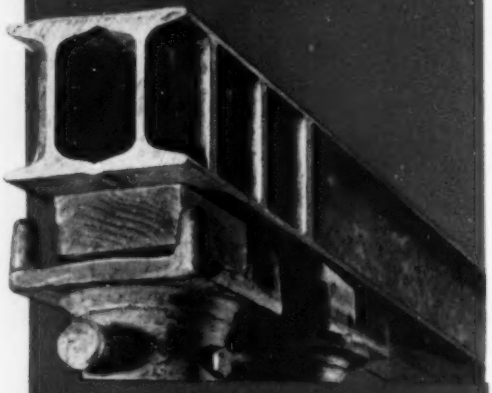
P.5671

WHERE CONDITIONS ARE TOUGHEST INCREASE WORKING EFFICIENCY AND SAFETY ...WITH THE 'PROLLOY' ROOF BAR





New improved all British version made from high tensile cast steel "I" section bar, has staggered ribs for extreme resistance to twist and crush. Combined with high joint strength, these features result in ability to carry considerable cantilever tip loads. This bar also features captive joint members which are *easily replaceable underground*, fully retractable wedge for *free articulation of joint*, and specially shaped *replaceable tongue*, which takes all male end wear.

"N.C.B. Approval No. B.17"

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The S.M.R.E. bar—the first bar designed and manufactured for the support of Roadheads and Stables.

Designed by the Safety in Mines Research Establishment, to reduce fatal accidents and improve efficiency at roadheads and stables. The bar is manufactured from two special joists of high tensile steel to BS 968, giving an effective distribution of material over the cross section with the consequent improvement in its strength/weight ratio, and stability. The capabilities of this are fully exploited by hardening and tempering the welded bar under close control in modern furnaces. This produces in the finished bar, the optimum combination of strength and ductility at the low weight of **16·5 lb./ft.**

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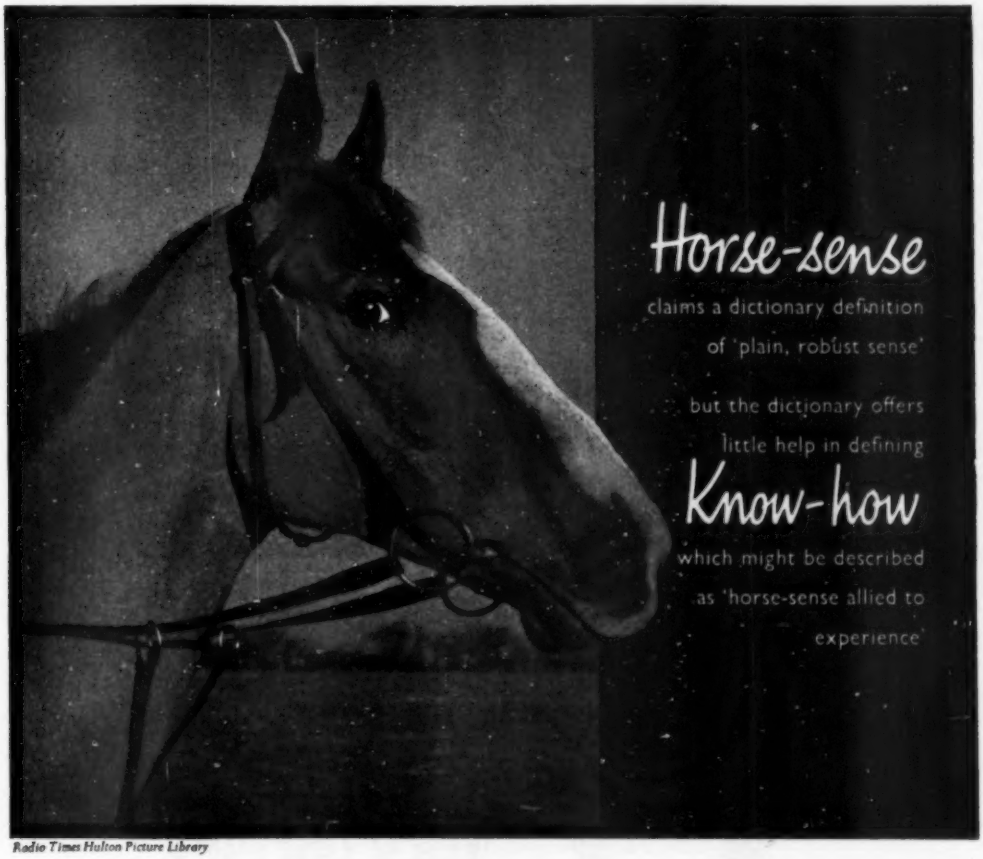

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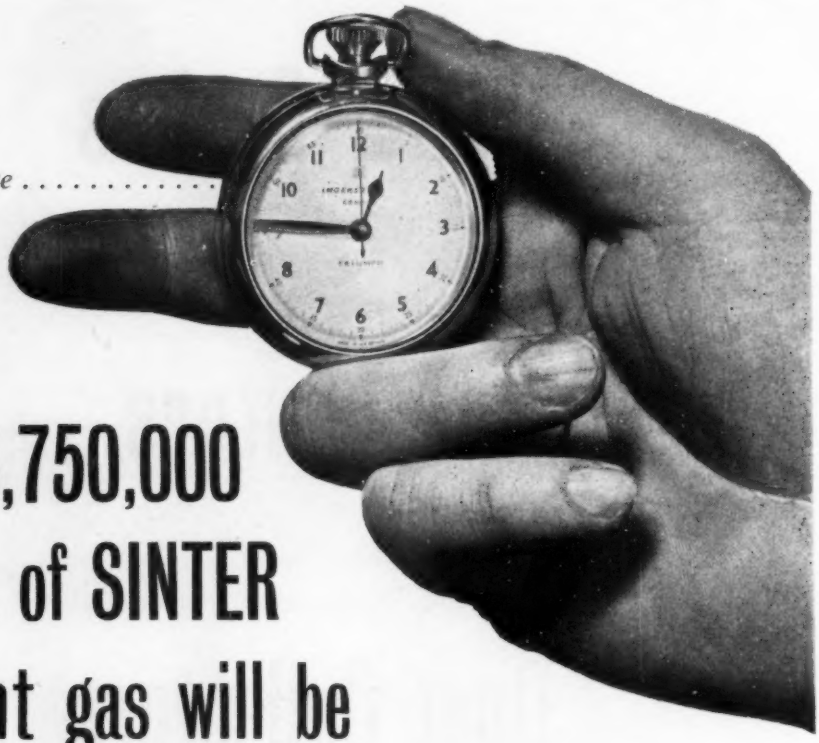

and 3,750,000 cu. ft. of SINTER plant gas will be cleaned by our precipitators

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CLOSURES

Circular, specially reamed ends ensure gas tight closures with rubber bungs. Porous alumina plugs to prevent iron oxide carry-over also available.

For use in any high temperature furnace, particularly for carbon and sulphur determination in steel, operating at temperatures up to 1500°C. (2732°F.). These tubes are completely reliable, do not devitrify or allow loss of combustion gases even up to maximum working temperatures. Thermal aluminous porcelain 525 sheaths are excellent for use as pyrometer sheaths up to 1500°C.

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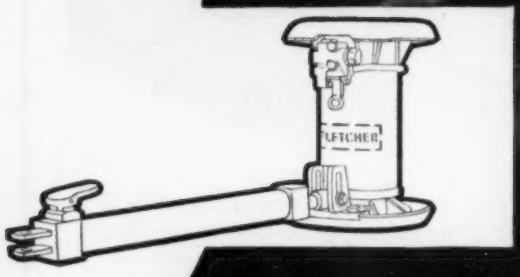
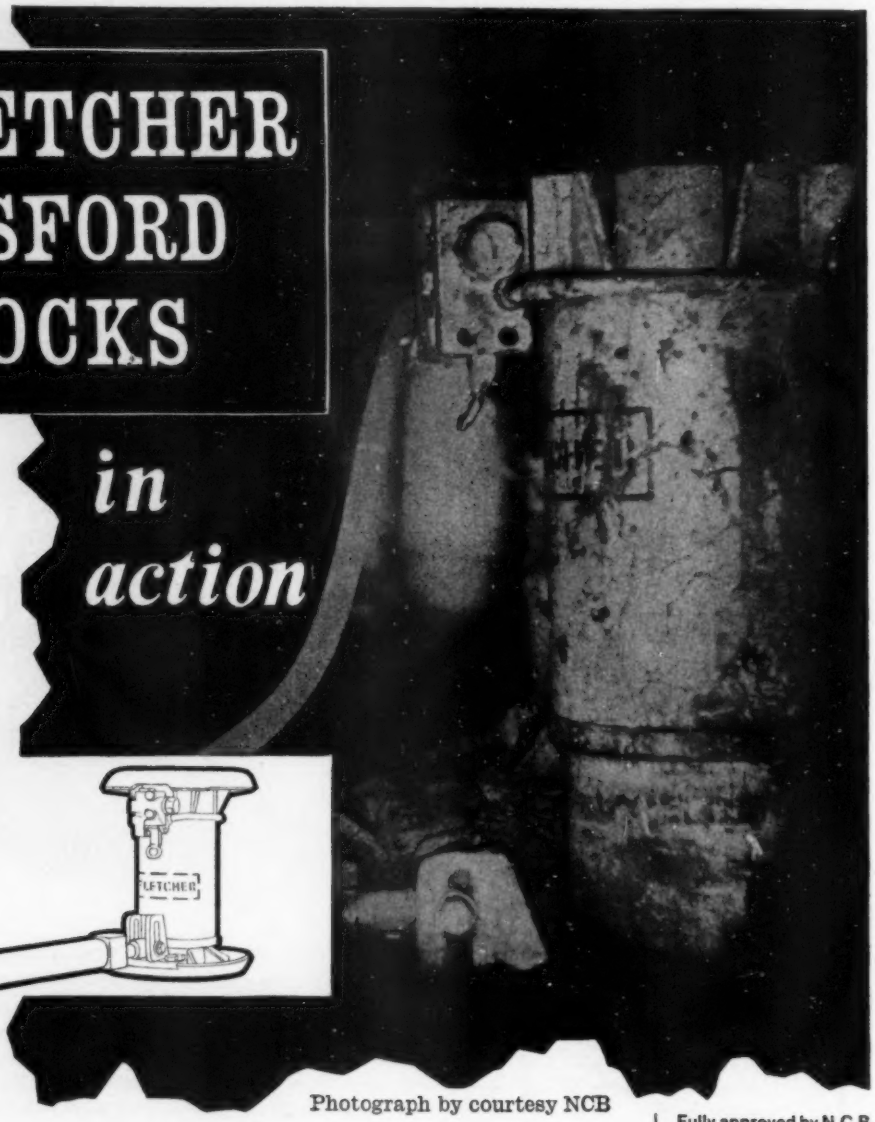
FLETCHER DESFORD CHOCKS

in action





Photograph by courtesy NCB

Following successful installations in the East Midlands Division, the Fletcher Desford hydraulic chock has gained a reputation for reliability.

50 and 100 ton versions: 6″ to 18″ stroke at 2″ intervals.

Fully approved by N.C.B —H.15 and H.11.

Ancillary equipment by Fletcher includes:

double-acting hydraulic ram up to 2′-6″ stroke

detachable ram anchor brackets

extension pieces 6″ & 12″

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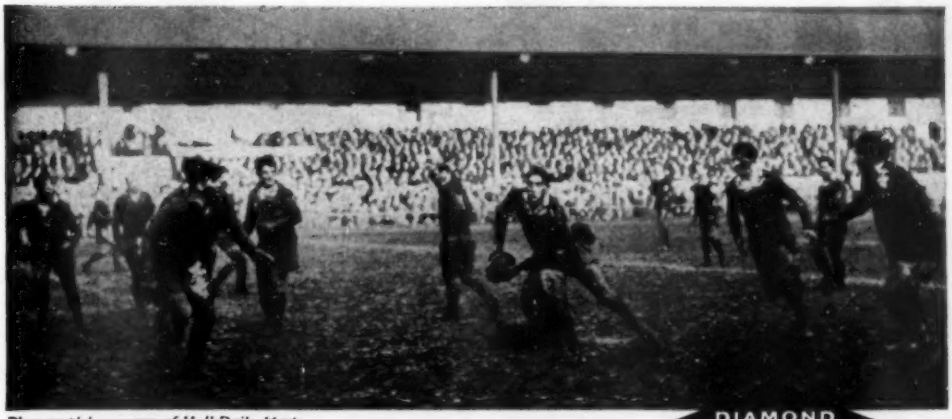
where wet conditions are a hazard



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DIAMOND TYPE

Fenaplast COLLIERY CONVEYOR BELTING

is the answer!

Like international forward John Whiteley,
Fenner Diamond type belting is a top-class performer under all conditions.
Why? Because the handling ability of Diamond belting is backed by a cover defence that withstands even the injurious attack of mine water.
The all-round strength of this new range of colliery conveyor belting eliminates breakdowns in vital movements—
puts an end to the penalty of production losses.
It is proving a winner in all tests . . . especially where wet conditions are a hazard.

RANGE OF DIAMOND TYPE BELTINGS AVAILABLE					
N.C.B. APPROVAL NO.	150	158	149	158 HD	149 HD
TYPE	LIGHT DIAMOND	STANDARD DIAMOND	DOUBLE DIAMOND	HEAVY DIAMOND	EXTRA HEAVY DIAMOND
BREAKING LOAD MINIMUM PER INCH WIDTH	2000 LB	2000 LB	2500 LB	3000 LB	4000 LB
THICKNESS	7½ mm	8 mm	8 mm	8 mm	9 mm

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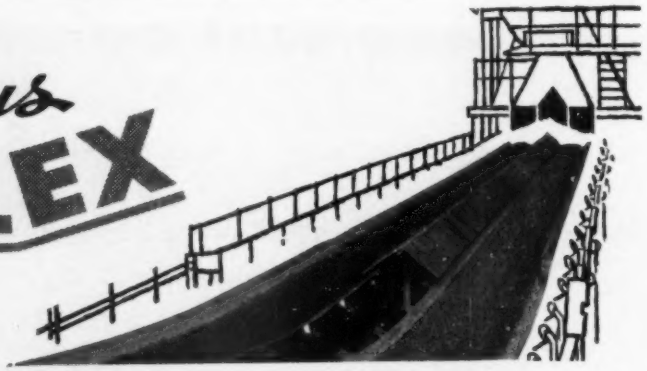
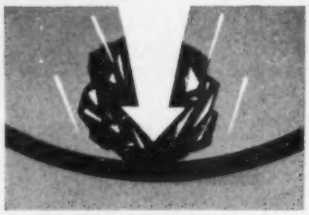
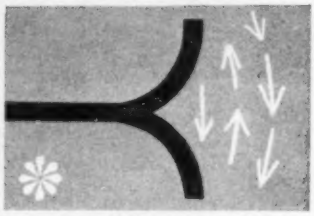


..the belt with the

Careful analysis of causes of failure in conventional belts has led to the development of Gaflex—the nylon wefted conveyor belt with five improved characteristics.





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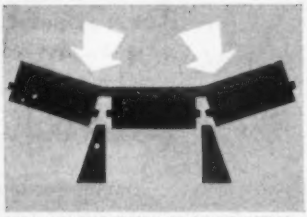
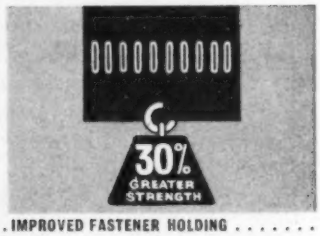
five point plan for





SUPERIOR TEAR RESISTANCE . . . . . IMPROVED TROUGHING CHARACTERISTICS . . . IMPROVED FASTENER HOLDING . . . . . .

better performance

★ *The flex life of the belt (previously the prime ageing factor of conveyor belting) is outstandingly increased by the nylon weft in Gaflex. The nylon weft gives supreme 'across the belt' strength and, at the same time, allows for a reduction in belt thickness —four plies of the new fabric are equal in strength to five conventional fabric plies.*

GAFLEX has nylon weft for *extra* strength and flexibility

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—Huwood ML Loaders in the thinner seams.

Britain is rich in thin and medium seams—a form of richness which can be realised only if an economical method can be found to work them. The low initial cost of the Huwood Loader, types ML/6 and ML/7, is one of the many points in their favour in these conditions—but there are many more, particularly now that their well established method of loading is matched by an equally efficient means of propulsion.

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MINE CAR TIPPLERS
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CONVEYORS AND BUNKERS
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LANDSALE PLANTS FOR
LORRY LOADING

RECIPROCATING
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FOR ALL DUTIES
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RUN - OF - MINE
SCALPING
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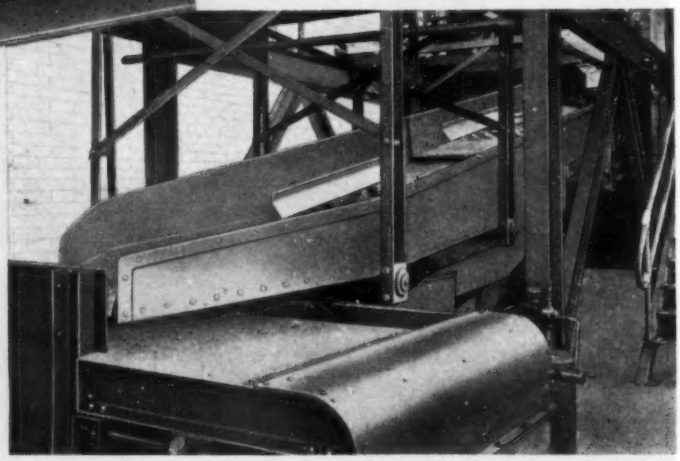

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Also complete COAL CLEANING AND HANDLING PLANTS of the most efficient type including COAL WASHERIES of any capacity designed to clean RUN-OF-MINE COAL arranged with
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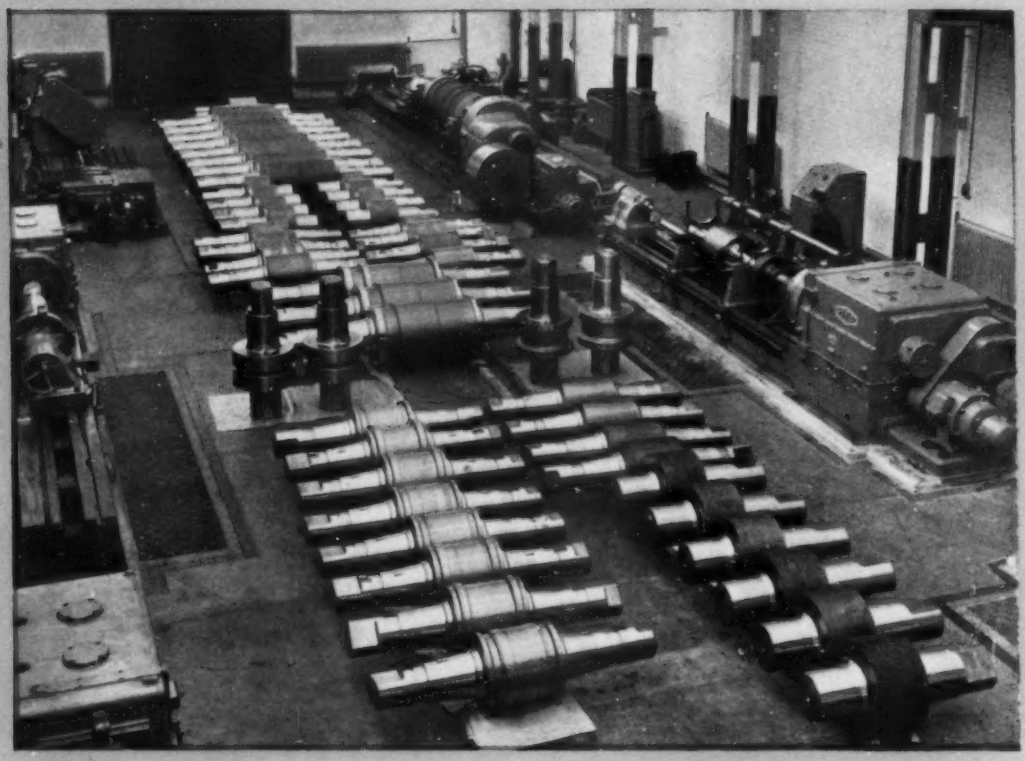

The above is one of the many consignments of rolls forming part of the complete initial fillings and spares we have manufactured in Our Specially Toughened Alloy Spheroidal Graphite and Mooralloy Qualities for the Morgan Billet, Sleeper Bar and Slab Mill at DURGAPUR WEST BENGAL.

Considerable economies in materials, production time and maintenance costs can be effected by using **OUR SPECIALLY TOUGHENED SG ROLLS** or in conjunction with our well-known **SUPER METAL MOORALLOY ROLLS** for Continuous Billet Mills. Idle time resulting from the need for redressing is reduced to a minimum, thereby giving increased tonnage. It is necessary to select the correct quality from the very wide range now available to suit the conditions and requirements in modern mill practice.

On the opposite page we show the principal grades of **OUR SPECIALLY TOUGHENED SG ROLLS** and **OUR SUPER METAL MOORALLOY ROLLS,** but each of these quality ranges are again subdivided to suit requirements.

PLEASE CONSULT US SO THAT WE CAN ADVISE YOU

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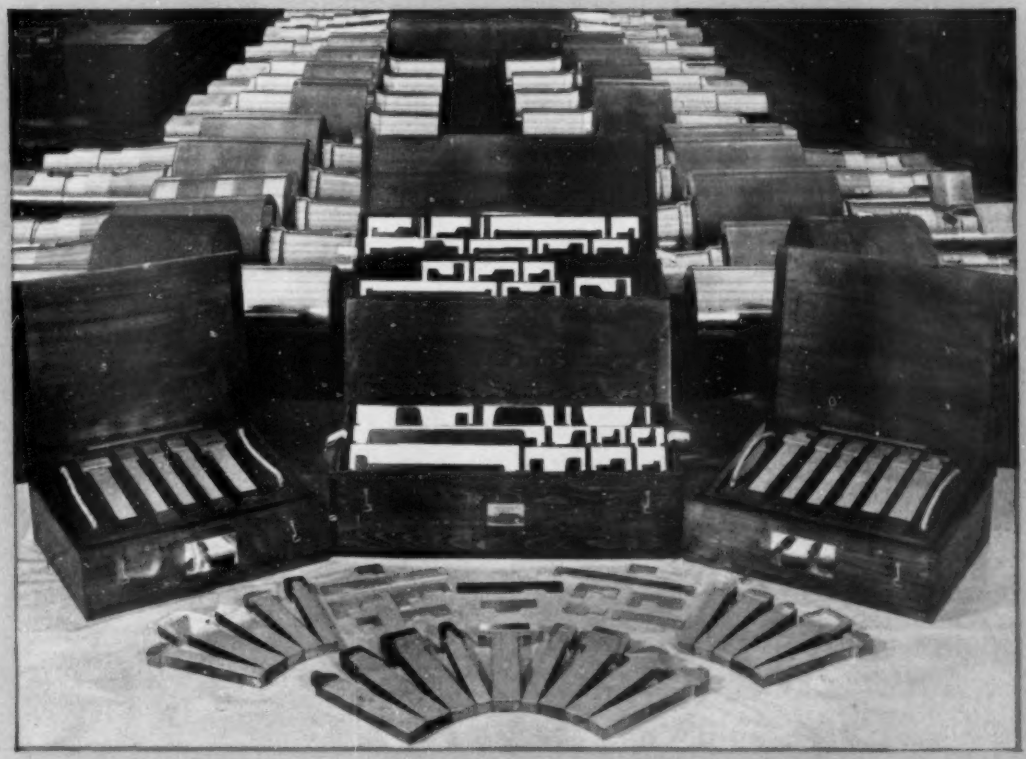

Part consignment of Finish grooving tools and precision master gauges manufactured and supplied by us for the Morgan Billet, Sleeper Bar and Slab Mill at DURGAPUR WEST BENGAL

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SPECIALLY TOUGHENED ALLOY SPHEROIDAL GRAPHITE PEARLITIC RANGE

SGSXA	..	Very tough.
SGSXB	..	Tough and Medium Hard.
SGSXC	..	Tough and Hard.
SGSX Super C	..	Tough and Very Hard.

SPECIALLY TOUGHENED ALLOY SPHEROIDAL GRAPHITE ACICULAR RANGE

SGSXAC A	..	Very Tough.
SGSXAC B	..	Tough and Medium Hard.
SGSXAC C	..	Tough and Hard.
SGSXAC Super C	..	Tough and Very Hard.

SUPER METAL MOORALLOY RANGES

The "SSX" Range of Tough Metal—"SSX", "SSXM", "SSXH"
The "XL" Range of Tough Medium Hard Metal—"XLM", "XL", "XLH"
The "XXL" and "XXXL" Ranges of Hard Superfine Close Texture Metal—"XXL", "Super XXL" hard texture, "XXLAC", "XXXLAC", "Super XXXLAC" Acicular Flake.

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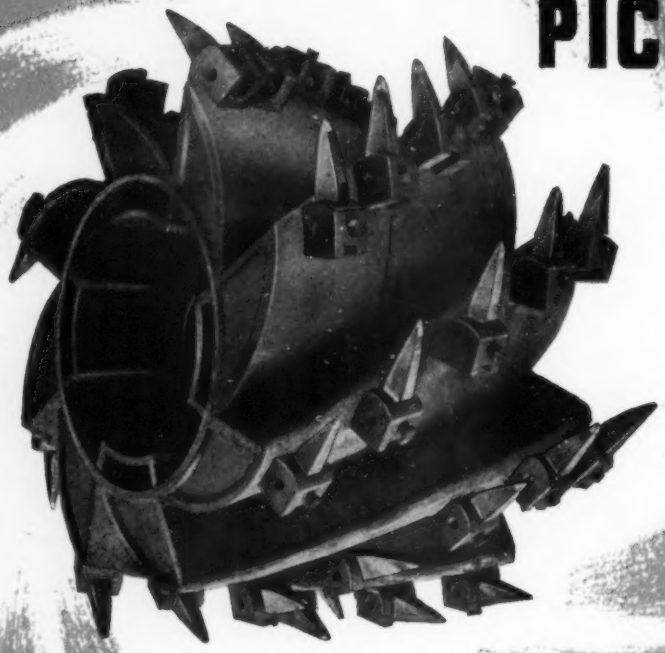

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★ A MINERS PICK, MECHANISED
★ AMPERAGE DOWN
★ LARGER COAL
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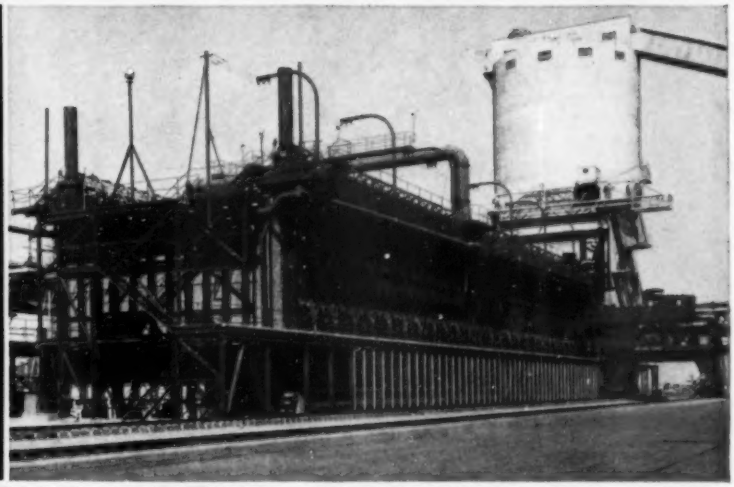

CORBY—THE DEENE COKING PLANT

The commissioning of the new Deene Coking Plant at Corby marks the completion of the first stage in the coke oven development programme planned for Corby by Stewarts and Lloyds Limited.
The new installation comprises a battery of 51 Woodall-Duckham Becker coke ovens with a coal carbonising capacity of 1120 tons a day, a by-products recovery plant and extensive plants for coal handling and blending and coke handling, screening and storage.
This is the sixth W-D coking installation to be built at Corby for Stewarts and Lloyds Limited.

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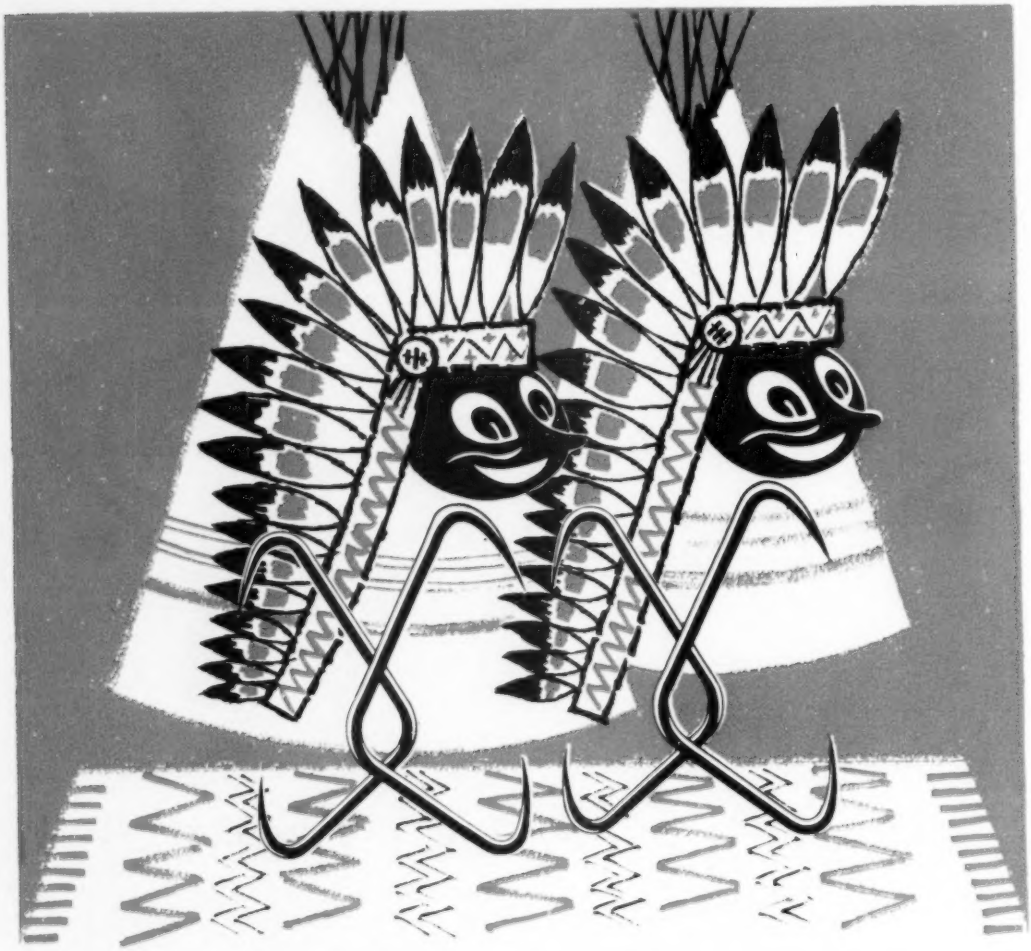

TWINS HAVE UM PLENTY STRONG NEW CONVEYOR BELT MEDICINE

and ere many more moons have passed
the tribe of Chief Broken Joint will have been vanquished by the new magic.

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PATENTED CONVEYOR BELT FASTENERS

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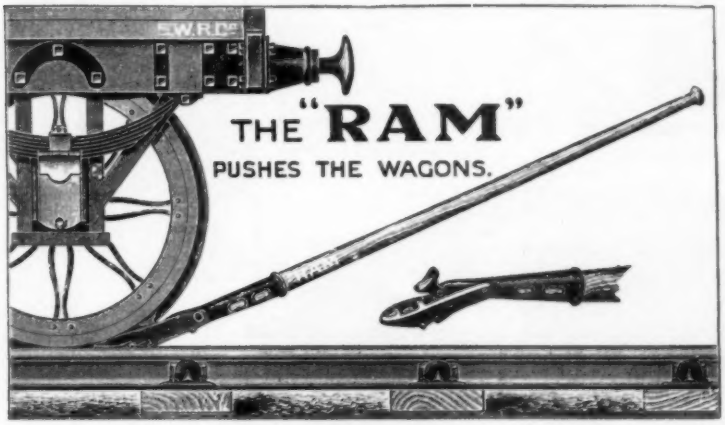
RAILWAY WAGON PINCH BAR

A "NEVER SLIP" HAND SHUNTING ENGINE

For Moving Wagons Short Distances

SEVEN DAYS FREE TRIAL



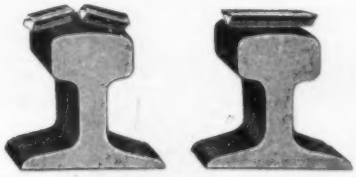
PRICE 98/- EACH NET.

BE PREPARED FOR

Frosty Weather, Icy Rails and Frozen Axle Boxes

— *ITS ADVANTAGES* —

The "Ram" Pinch Bar is the most powerful implement ever invented for moving Wagons and Locomotives short distances by hand. The whole bar being made of the best Malleable and Cast Steel, with Wood Handles, gives it great strength and durability, and is light to handle. ***It will not slip backwards*** from under the wheel on wet, greasy, icy or rough rails. It will work equally well over points and crossings.



Our "Never Slip." Old type often slips.

OUR GUARANTEE. *– We guarantee every one of our Pinch Bars to move more loaded or empty wagons further and faster per stroke of handle, and to do so with much less effort than is required by other makes of Pinch Bars; that they will work to full capacity and efficiency under the lowest break beam, on planked tracks, frogs, switches, inclined tracks, curves, narrow or wide rails, points and crossings, and that it will not slip on frozen, wet or greasy rails. We guarantee that it will work to full advantage wherever it is possible to move a wagon by hand.*

THE

SHEFFIELD WIRE ROPE CO., LTD

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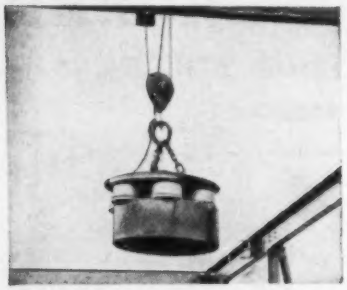
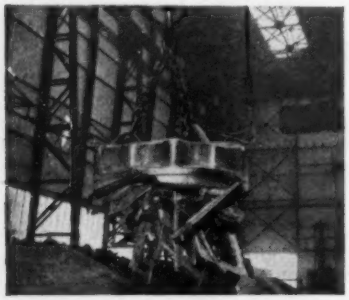
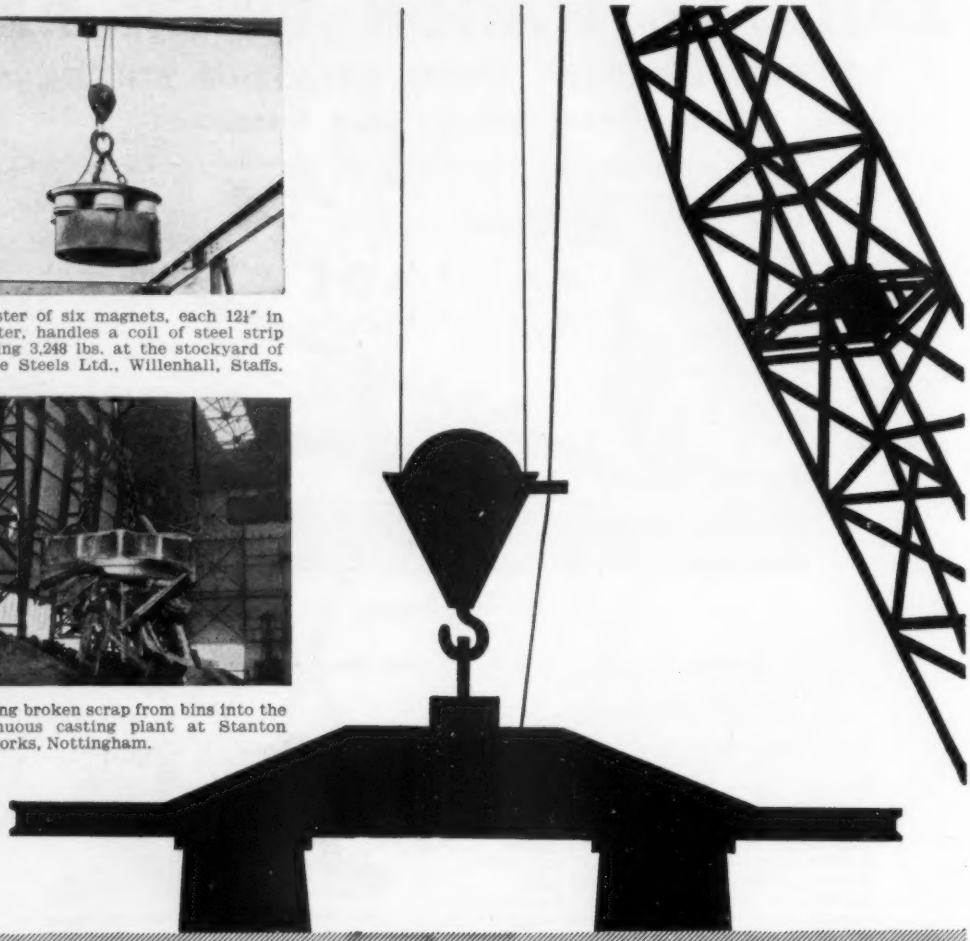


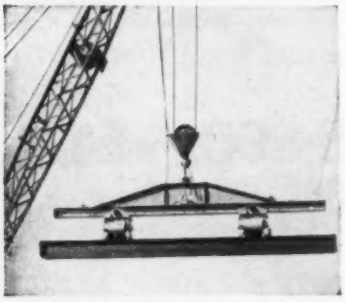
A cluster of six magnets, each 12½" in diameter, handles a coil of steel strip weighing 3,248 lbs. at the stockyard of Ductile Steels Ltd., Willenhall, Staffs.



Loading broken scrap from bins into the continuous casting plant at Stanton Ironworks, Nottingham.



WITTON-KRAMER LIFTING MAGNETS FOR EVERY JOB



Two bi-polar magnets on spreader beam lifting rolled steel joist.

Whether handling hot steel billets and ingots or salvaging metal from under water, Witton-Kramer electric magnets do the job superbly. Circular, rectangular or bi-polar, G.E.C. makes them all with coils designed and constructed to withstand heavy duty and shock loads. All Witton-Kramer magnets are easily maintained and quickly serviced.

RELY ON THE EXPERIENCE OF G.E.C.

G.E.C. (ENGINEERING) LIMITED · WITTON-KRAMER DIVISION · BIRMINGHAM 6

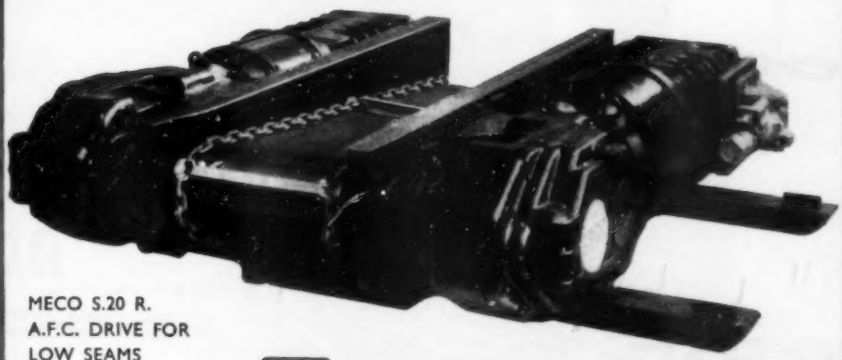
388

Meco

EXTRACT FROM "IRON & COAL" OCT. 27th 1961.

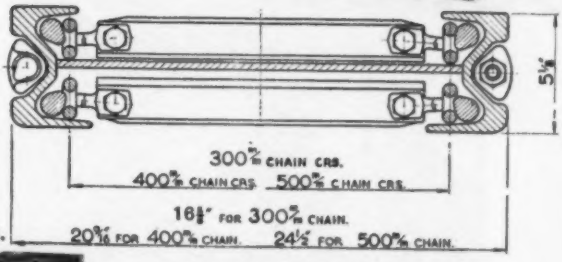
"Miners working a completely mechanised coalface in the N.W.6 district of the five quarter seam at Linton Colliery, Morpeth (Northumberland), achieved an O.M.S. of 22.19 tons during the week ended October 7th, 1961" . . .
This high output was obtained from a 2' 10" seam. The conveyor concerned was a Meco S.20 R.A.F.C. using **5** inch line pans manufactured by Meco to N.C.B. Specification and 14 mm. chain.

5 INCH!

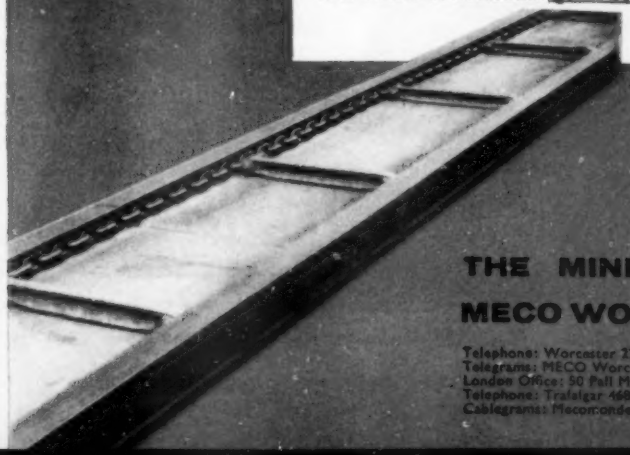


MECO S.20 R.
A.F.C. DRIVE FOR
LOW SEAMS

The reliability and robustness of this heavy duty compact conveyor offers practical advantages in low seam conditions.



SECTION THROUGH CONVEYOR



THE MINING ENGINEERING CO. LTD.,
MECO WORKS, WORCESTER,

Telephone: Worcester 22291 (7 lines).
Telegrams: MECO Worcester.
London Office: 50 Pall Mall, London, S.W.1.
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POWER WITH SAFETY

The WILD Chain Tensioner is saving time throughout the mining industry. It solves the problem of taking up slack in conveyor chains and is operated easily by one man. Send for leaflet on this subject.

WILD

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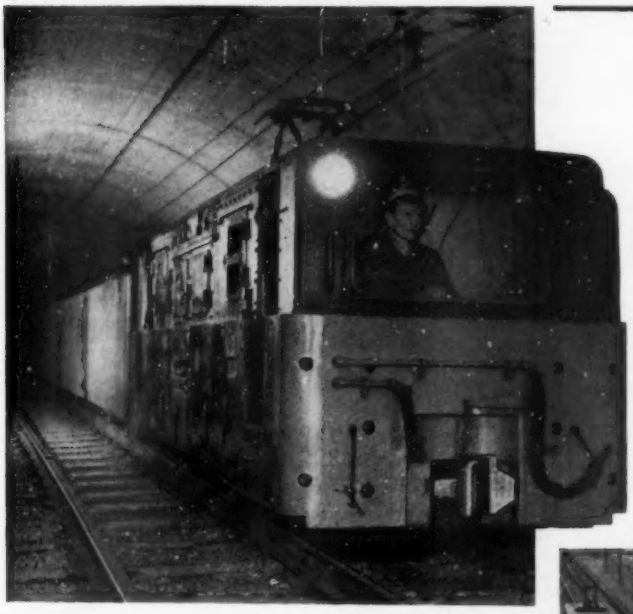
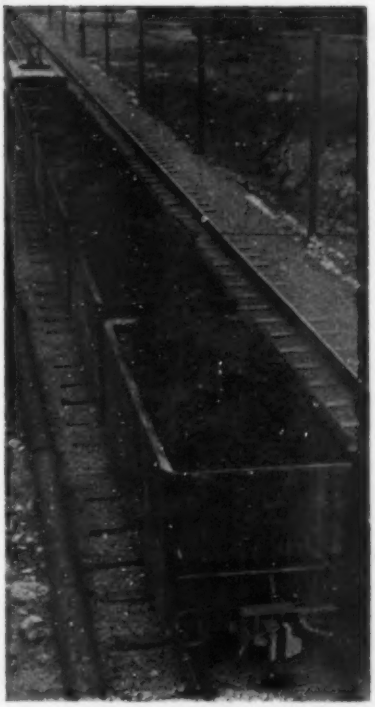
dmAW121



Why are ESC Willison Automatic Couplers used in Iron Ore Mines?



Photos by courtesy of Stewarts & Lloyds Minerals Ltd.

For exactly the same reasons that they are also used in Coal mines, Steelworks and Hydro-electric tunnelling.

- They couple automatically when buffed together. This ensures safety to haulage personnel by eliminating the necessity for going between cars.
- They can be "lock-set" to permit buffing without coupling.
- Rotary tippling of cars without uncoupling can be arranged.
- The angle of mated couplers on curves is limited only by the design of the car.
- Derailment troubles are decreased because "Willison" couplers always tend to hold the cars on the track.
- Reduced costs of transportation are obtained through increased speed in car handling.

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CASTINGS CORPORATION LTD.
River Don Works, Sheffield

A WHOLLY OWNED SUBSIDIARY OF ENGLISH STEEL CORPORATION LTD.

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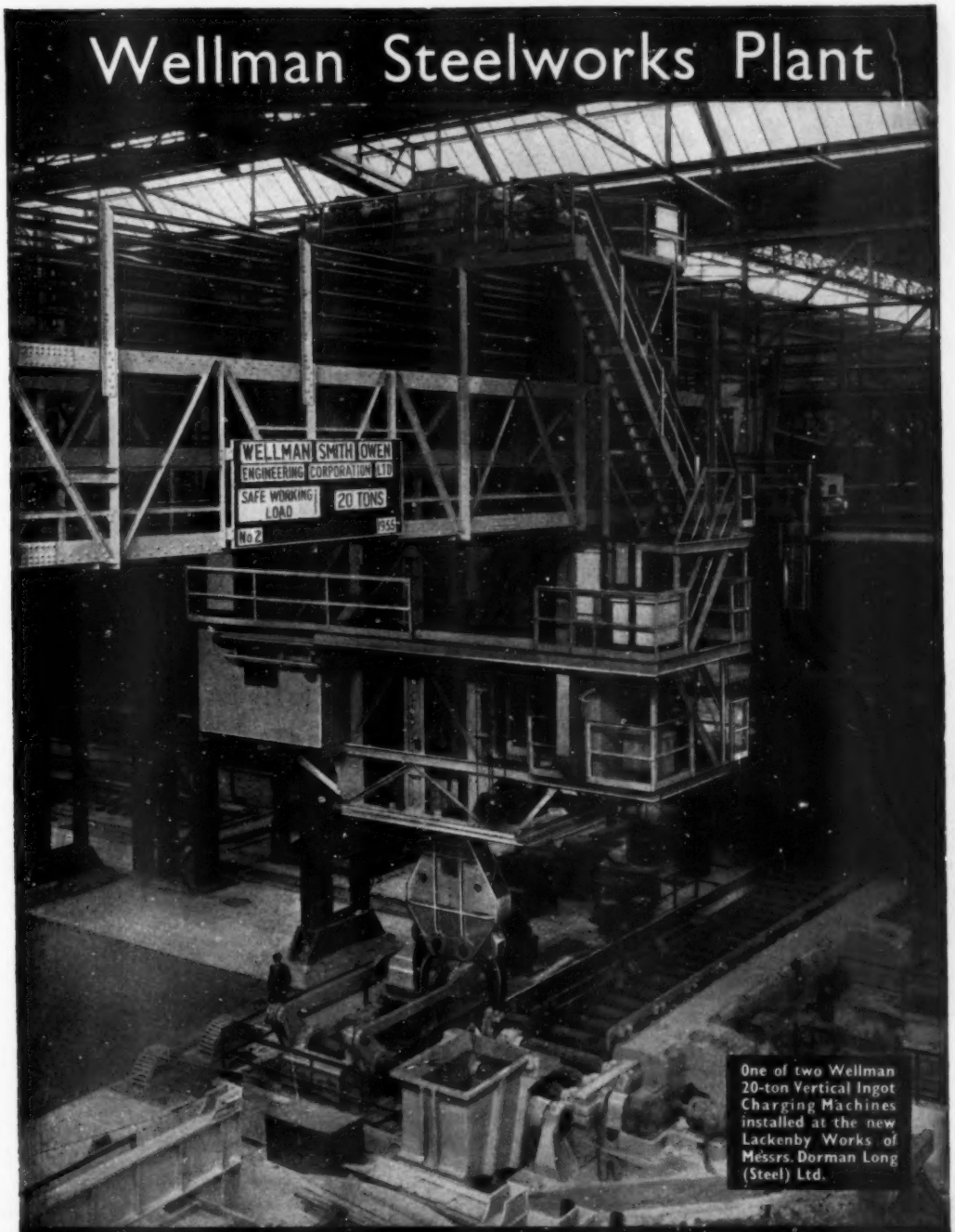


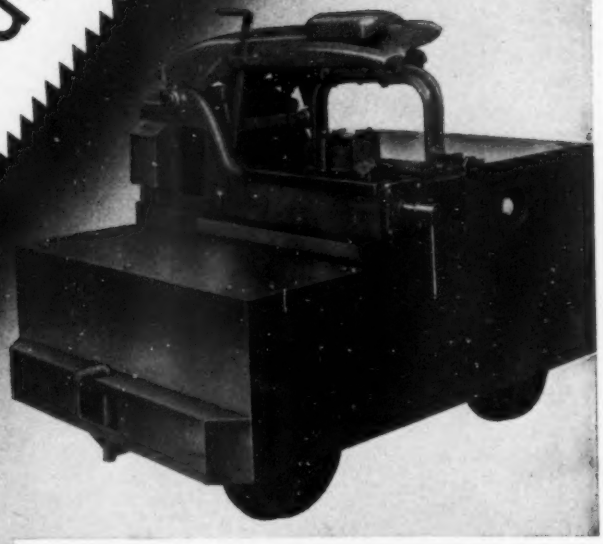
One of two Wellman 20-ton Vertical Ingot Charging Machines installed at the new Lackenby Works of Messrs. Dorman Long (Steel) Ltd.

THE WELLMAN SMITH OWEN ENGINEERING CORPORATION LTD.

PARNELL HOUSE, WILTON ROAD, LONDON, S.W.1 WORKS: DARLASTON, South Staffs, & BELFAST.

Siskol..

underground saw unit



A mobile unit powered by compressed air or electric motor for sawing steel underground with safety and speed.

Write for particulars.

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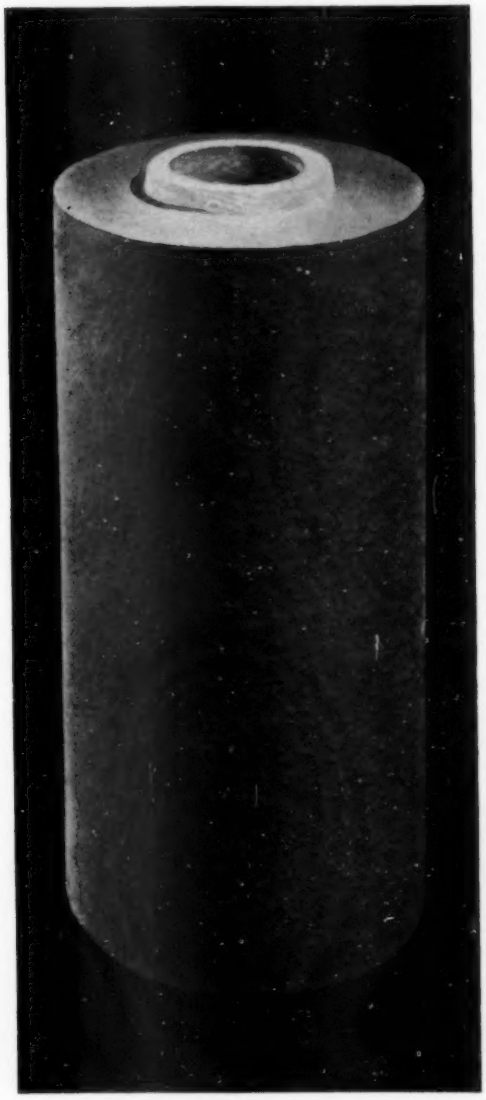

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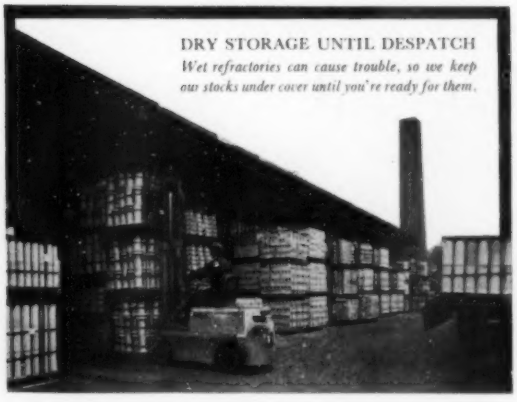
Just the kind of products you'd expect from a firm which pioneered the manufacture of casting pit refractories, and which still specialises in this field.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Wet refractories can cause trouble, so we keep our stocks under cover until you're ready for them.

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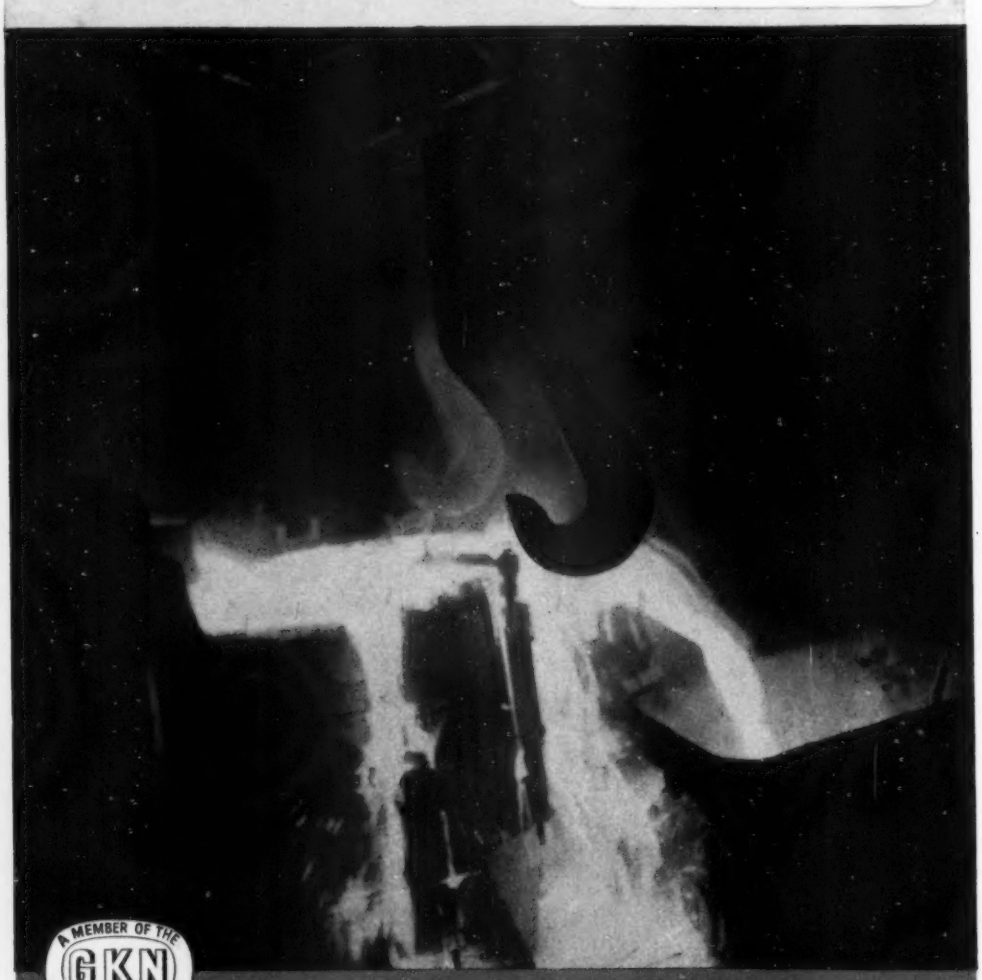

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LYSAGHT'S SCUNTHORPE WORKS — Branch of G.K.N. Steel Company Limited
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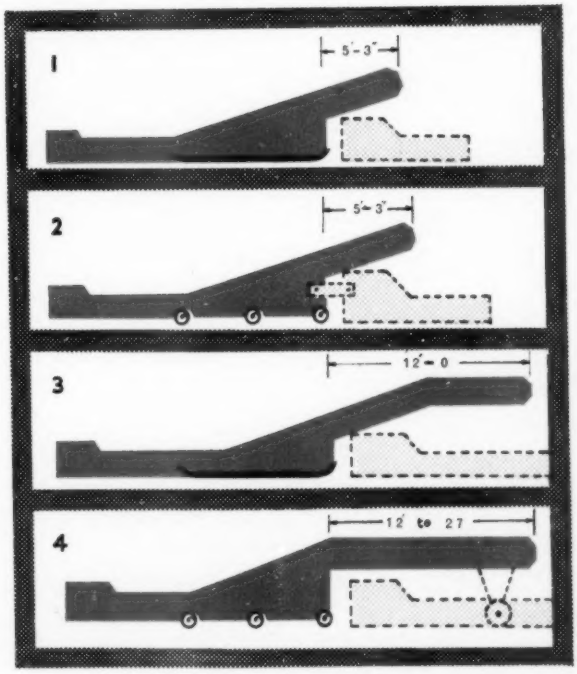
Applied to underground mechanisation it means exactly the same thing as:— "THE RIGHT MACHINE FOR THE JOB". The Cowlishaw Walker armoured gate feeder or stage loader is exactly this, it is not an improvisation of a machine originally designed for other duties. It was designed expressly for efficient coal clearance at the ripping lip of a power loaded coal face.

It was originally made in the 24 inch size only, but is now available in the 30 inch width as well to cater for the higher concentrations of tonnage which recent developments in mechanisation have made possible. Its versatile design allows it to be supplied in a variety of forms to suit individual needs and on the 30 inch size it can be arranged to advance under its own power.



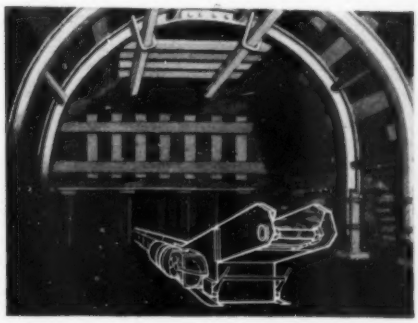
1 It may have a short jib and be mounted on a sledge.

2 It may be mounted on wheels, be permanently attached to the tail unit of the gate belt, the whole being pulled forwards together.

3 It may have a cranked jib giving extra discharge room.

4 Or it may have an extra long jib supported on wheels and if required on the 30 ins. size it can advance under its own power.

The right machine for the job



COWLISHAW WALKER & CO. LIMITED

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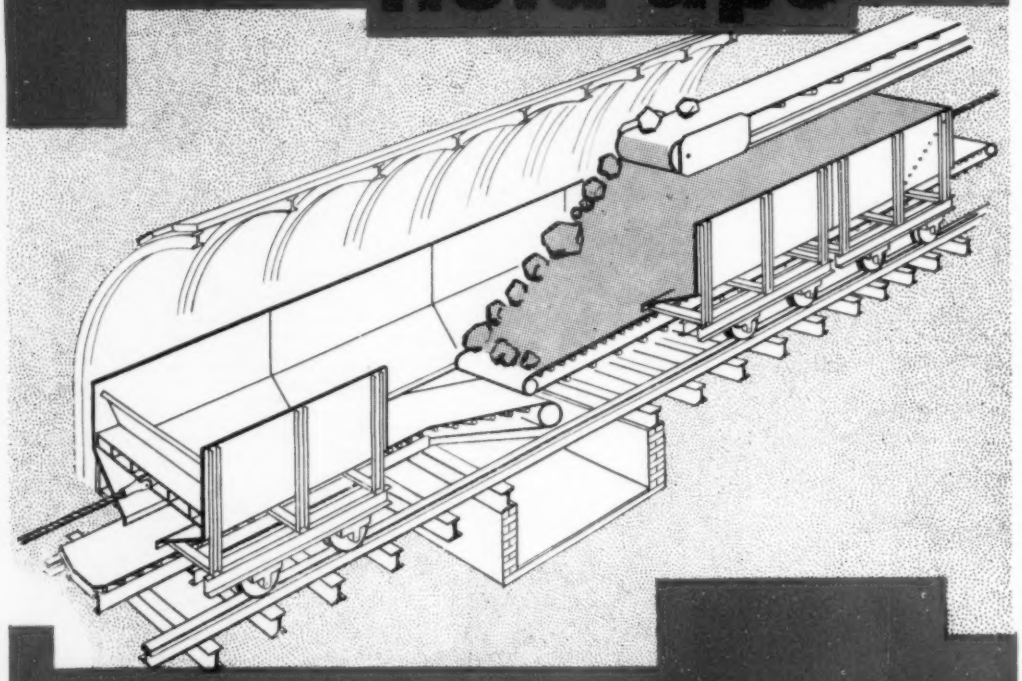
minimise production breakdown hold-ups



THE WALKER-HORROCKS ANTI-BREAKAGE MOBILE STORAGE BUNKER

Developed in No. 6 Area, East Midlands Division, N.C.B.

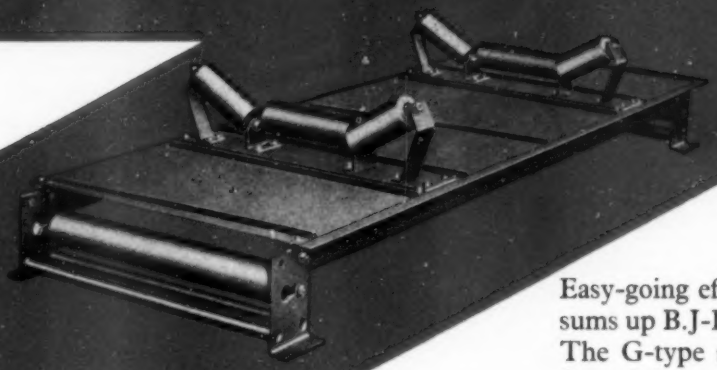
Now you can ensure a steady production flow during haulage and shaft breakdowns or derailments *with the absolute minimum of degradation.* The Walker-Horrocks Bunker collects coal from the in-bye conveyor forming a reservoir of 50 to 400 tons (5 to 40 cars) during hold-ups. It can also be used as a Storage Unit for backshift working. Easily operated by the Transfer Point Attendant, the Bunker can be installed by normal pit labour. Installation does *not* interfere with normal working.

Further technical information available from the manufacturers:

WILLIAM RIGLEY & SONS LTD.

BULWELL FOREST, NOTTINGHAM
TELEPHONE: NOTTINGHAM 27-6581

'Easy-Going' EFFICIENCY



Easy-going efficiency; that about sums up B.J-D conveyer systems. The G-type structure is easy to fix and dismantle, and the grease-sealed idlers keep rolling smoothly.

For a minimum of friction, both mechanical and human, install B.J-D Conveyer Systems.

Can be slung from the roof

BJD G-type Sections

BRITISH JEFFREY-DIAMOND LTD., MINING DIVISION, WAKEFIELD, YORKSHIRE

THE STEEL INDUSTRY AND JOHN THOMPSON

Great names in Steel, all using John Thompson Steam Generating Plant.

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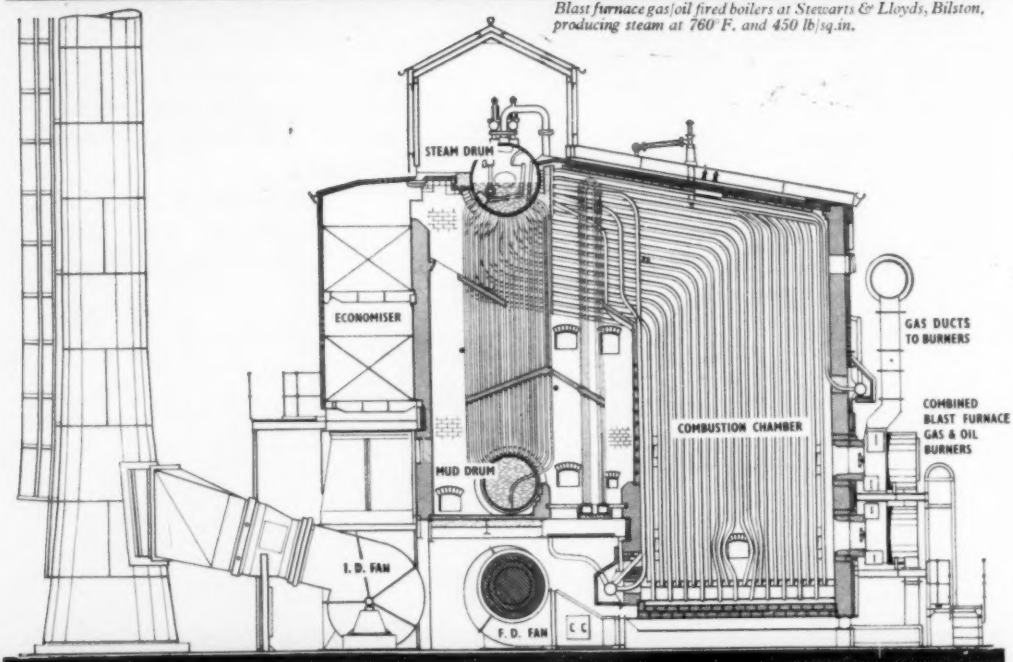
Blast furnace gas/oil fired boilers at Stewarts & Lloyds, Bilston, producing steam at 760° F. and 450 lb/sq.in.



John Thompson have supplied the Steel Industry with both natural and forced circulation water tube boilers fired with oil, blast furnace gas, coke breeze and coal; they have also installed a number of waste heat boilers, including forced circulation door frames on S.M.O.H. furnaces.

JOHN THOMPSON WATER TUBE BOILERS LTD. WOLVERHAMPTON

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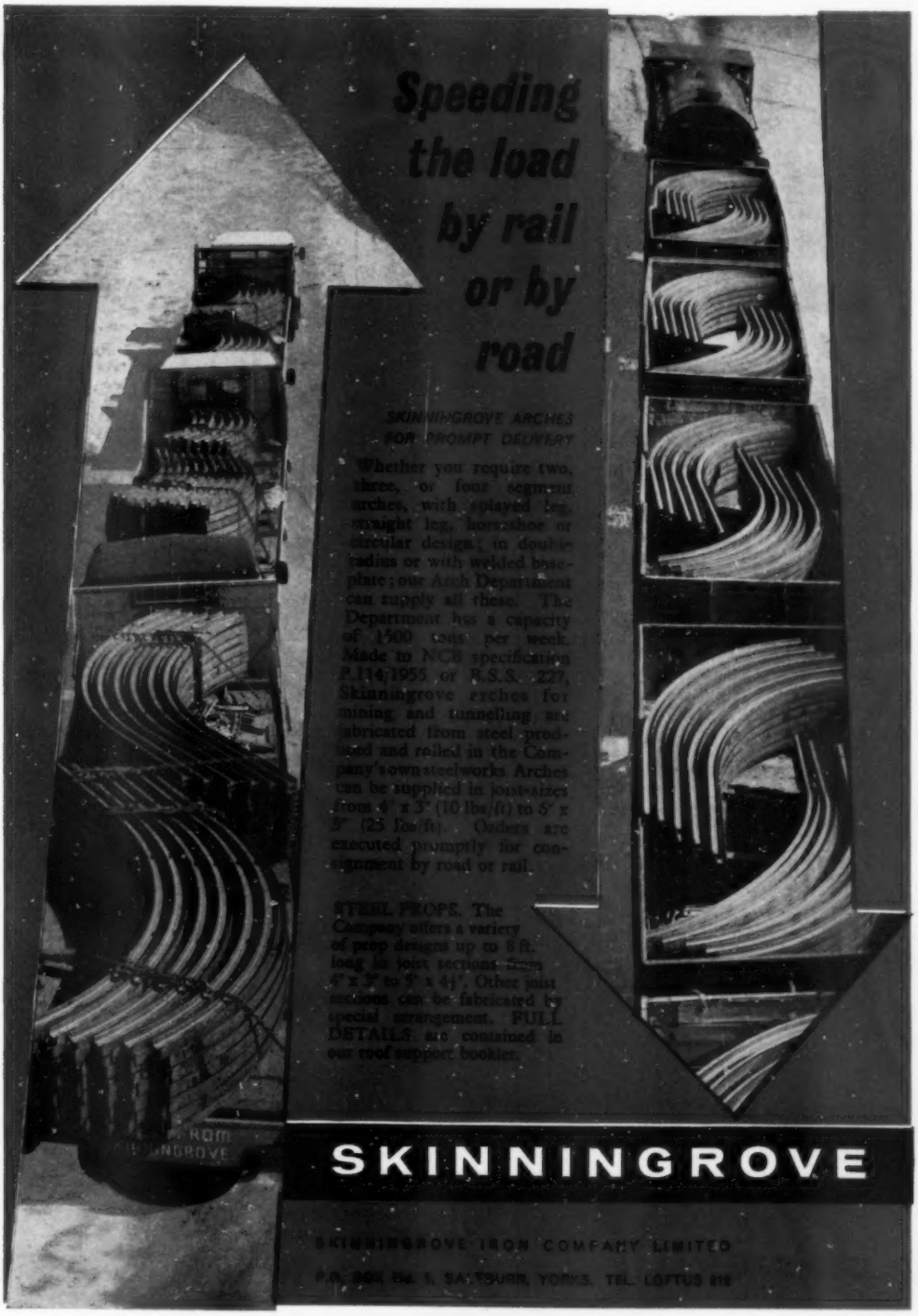
WTB/14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Whether you require two, three, or four segment arches, with splayed leg, straight leg, horseshoe or circular design; to double radius or with welded base-plate; our Arch Department can supply all these. The Department has a capacity of 1500 tons per week. Made to NCB specification P.114/1955 or B.S.S. 227, Skinningrove arches for mining and tunnelling are fabricated from steel produced and rolled in the Company's own steelworks. Arches can be supplied in joist sizes from 4" x 3" (10 lbs/ft) to 5" x 5" (25 lbs/ft). Orders are executed promptly for consignment by road or rail.
STEEL PROPS. The Company offers a variety of prop designs up to 8 ft. long in joist sections from 4" x 3" to 5" x 4½". Other joist sections can be fabricated by special arrangement. FULL DETAILS are contained in our roof support booklet.
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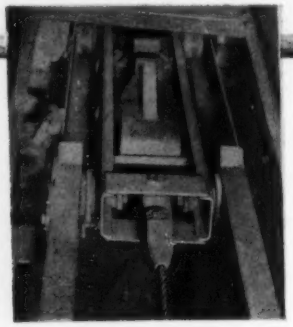
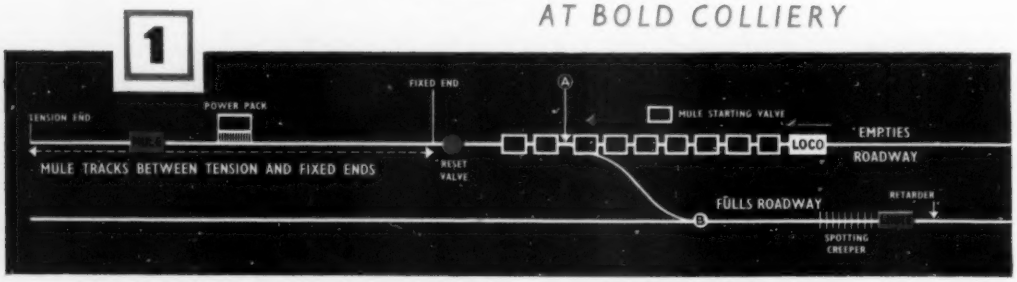
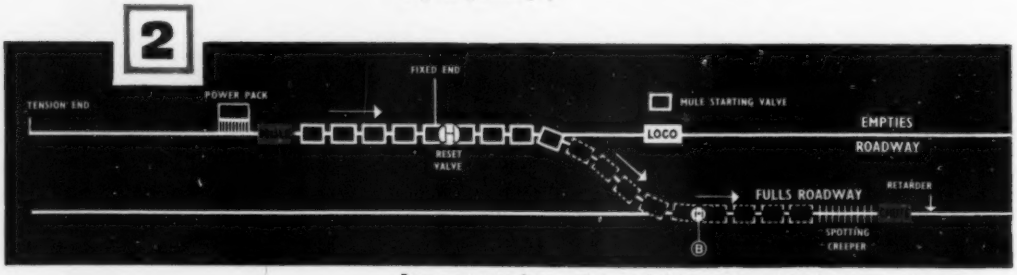


ROPE OPERATED MULE FOR ONE MAN TUB-HANDLING

AT BOLD COLLIERY



Loco pushes tubs along empties roadway, past leading edge of points **(A)**



Loco retreats from points and driver alters them in favour of tubs to switch to fulls roadway. He then operates* mule starting valve and mule pushes tubs down fulls roadway to loading chute.

* **From this point to the end of the complete loading operation, there is no further human intervention.**

3

The mule reverses automatically and returns to the tension end only when the last car of the train has cleared the reset valve. The colour lights for clearance of the empties roadway will not show green until:-

(a) the mule has returned to the tension end

(b) the last car of the train has cleared the light switch operating mechanism **(B)**

VIEWS ALONG THE LINE

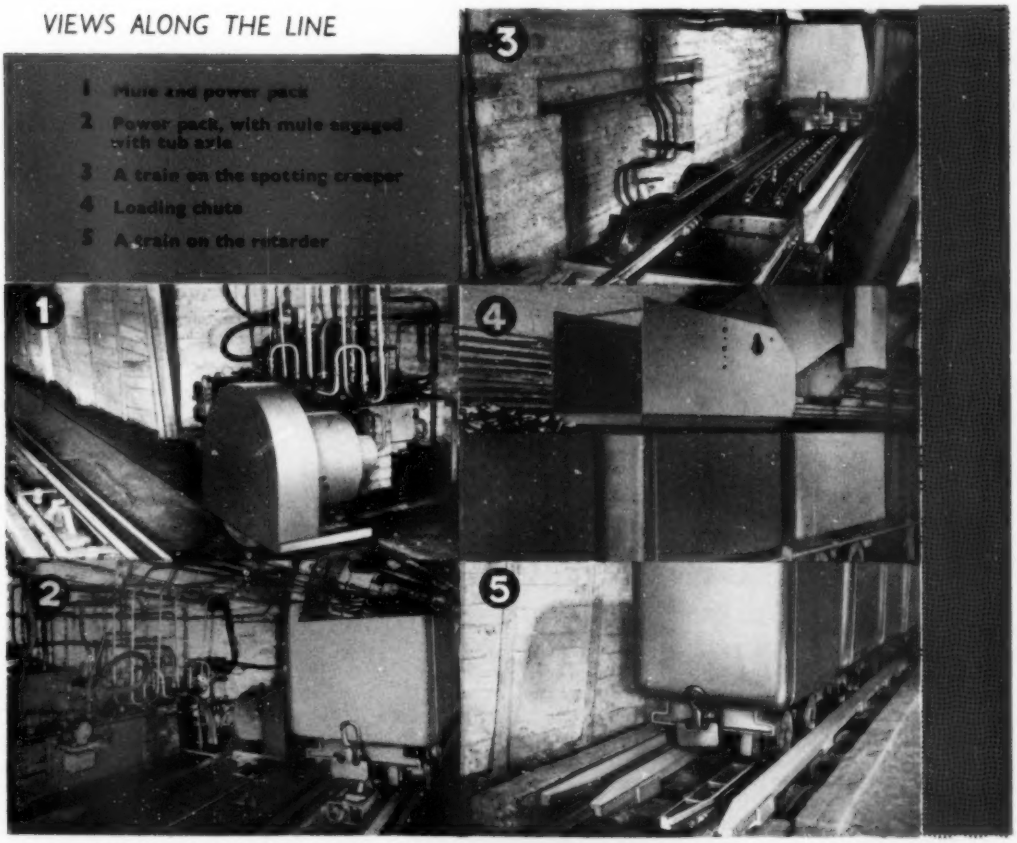
1 Mule and power pack

2 Power pack, with mule engaged with tub axle

3 A train on the spotting creeper

4 Loading chute

5 A train on the retarder



(Photographs by courtesy of the NCB North Western Division)

RICHARD SUTCLIFFE LIMITED
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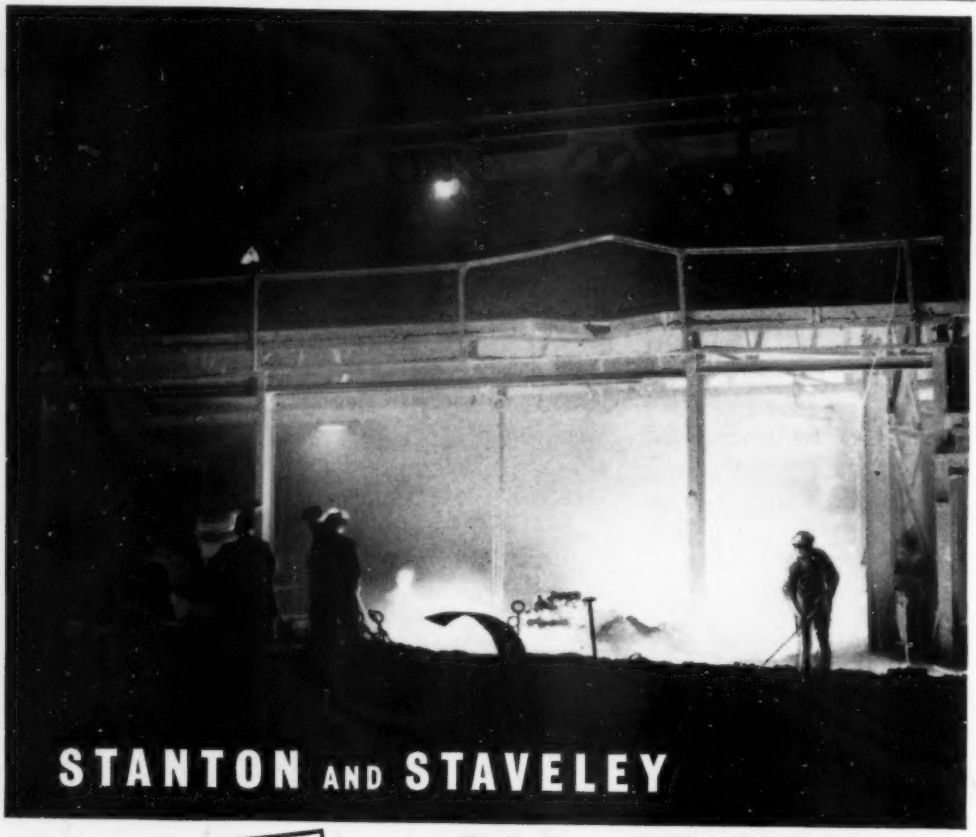

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Refined iron.

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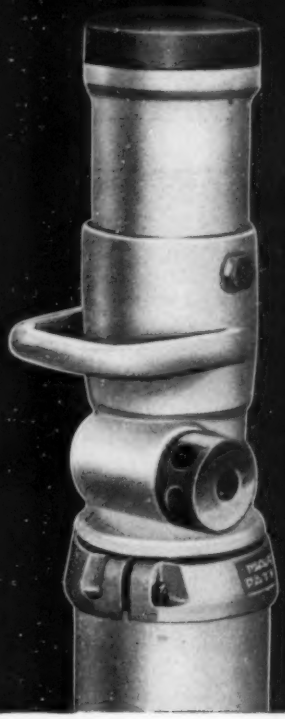
'PATHFINDER' CONTROLS CONVERGENCE
ASSURES GREATER SAFETY
—CUTS MAINTENANCE COSTS, TOO!



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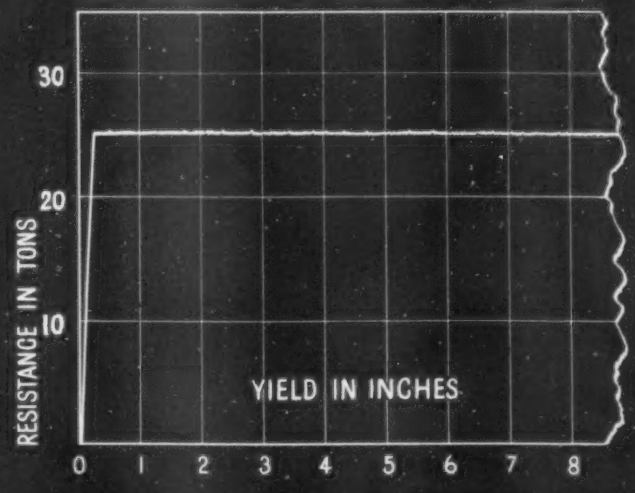
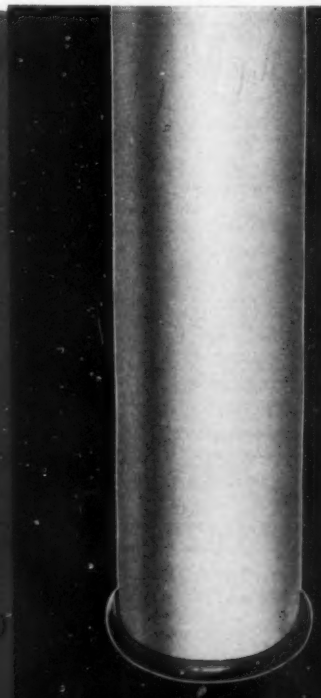
CHARACTERISTIC OF THE 'PATHFINDER' YIELD VALVE





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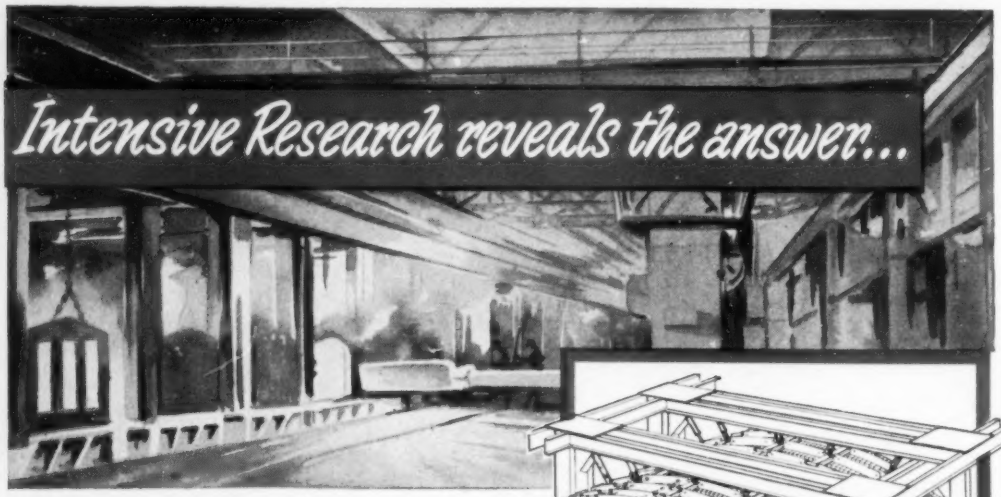
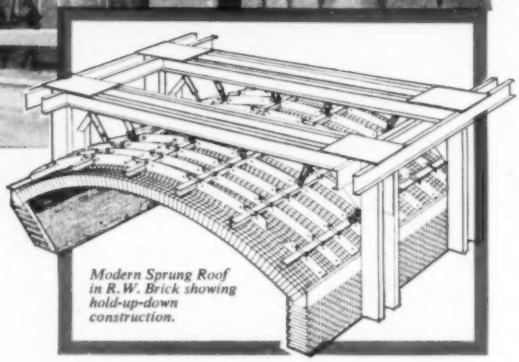
Makers of the 'Comet' Colliery Conveyor Belt Lacing System



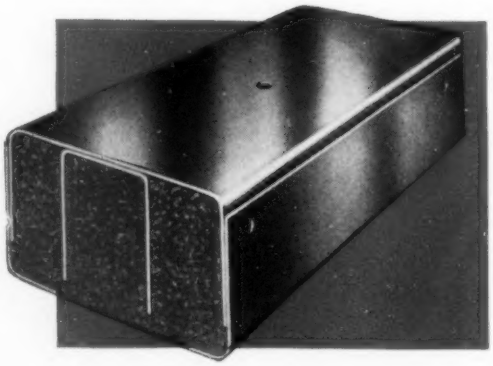


Modern Sprung Roof in R.W. Brick showing hold-up-down construction.

For outstanding performance in Basic O.H. Furnace Roofs there is no equal to the

Metalkase R.W. Brick (REINFORCED WELDED)

Suitable for every basic brick application, the Metalkase R.W. Brick is proving outstanding in performance in basic open hearth furnace roofs. It can be adapted to any type of roof construction, whilst in wall construction, R.W. Bricks can be used individually — preferably as headers — or they can be prefabricated into large sections to save installation time.



R.W. Bricks offer

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2. **Speedy installation.**
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IRON & COAL

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Home Heating

THE Ministry of Housing and Local Government has published the report* of a sub-committee appointed by the Central Housing Advisory Committee "to consider the standards of design and equipment applicable to family dwellings and other forms of residential accommodation, whether provided by public authorities or by private enterprise, and to make recommendations." Some of the sub-committee's findings are of great interest to coal and coke producers and distributors and to manufacturers of solid fuel burning appliances. One of its main recommendations urges that a considerably better basic standard of heating be adopted, and says that an improvement even on those better standards should be encouraged.

It is emphasized in the report that "better heating is the key to the design of homes at the present time," and the sub-committee goes on to point out that there are sufficient people prepared to pay for it so long as the source is convenient and the expenditure is under their own control. A home without good heating is a home built to the standards of a bygone age.

The findings and others contained in the report will doubtless bring comfort to many engaged in the provision of heat to domestic consumers, but to the solid fuel and appliance trades the report is not merely a message of hope—it is also a challenge. The implications contained in the report are quite clear: they show that the public will only be satisfied with systems which are clean and require little or no attention, that are safe and convenient in use, and provide a general level of continuous heat at reasonable cost.

The minimum standard of heating installation suggested is one capable of heating the kitchen and the areas used for circulation to 55 deg. F. and the living and dining areas to 65 deg. F. when the outside temperature is 30 deg. F. Assessments are made of the relative costs of the different fuels, based on the use of appliances of approximately comparable efficiencies to provide continuous heating. There is nothing in the figures which should cause any surprise, but the comments accompanying them warrant attention. Solid fuel gives the cheapest service except for short-period heating—that is to say, it is especially economical where continuous heating is required. Hot water as well as space heating can usually be supplied from the same appliance, with the addition, at little extra cost in fuel, of a towel rail and bathroom heating.

Solid fuel, therefore, is generally the cheapest and, moreover, domestic fuel appliances do not require specialist servicing. It is obvious that it has much on the credit side, but it has also its disadvantages, and the coal industry would be wise to consider what can be done to remove them. While solid fuel is generally the cheapest fuel it is at the same time the least convenient in use. The drawbacks are well known, and are mostly concerned with refuelling, ash removal, fuel storage, and fuel deliveries. It might perhaps have been pointed out in the report that the fact that fuel storage is necessary can have its advantages as well as its disadvantages. Solid fuel is one of the few fuels, and virtually the only indigenous fuel, that a domestic consumer can store against emergency. Power cuts and interference with piped fuel are not unknown.

Oil, by comparison, although less expensive than gas or electricity, is dearer than solid fuel, but has the advantage of being cleaner and more convenient and of being better adapted for short-period heating, time-switch control making automatic ignition a relatively simple matter. Fuel storage is still required, but delivery arrangements, on the whole, are simpler and cleaner, and oil enjoys the same advantage as solid fuel in being able as a rule to provide heating and hot water from a single appliance; on the other hand, oil-firing equipment requires regular specialist servicing.

Gas shares the advantages enjoyed by oil of being clean and convenient in use and flexible as regards control, and it has the further advantage that no storage is needed and no fuel deliveries are required. In many cases, although not invariably, separate appliances are required for water heating and space heating. It can, however, be accepted that fuel cost with gas installations is generally higher than with solid fuel or oil systems.

Electricity, due to its cleanliness and lack of residue, can be considered as the most convenient of all the fuels, particularly from an architect's or a builder's point of view, as it requires no flue and therefore imposes no restrictions of any kind on the planning of the dwelling or on the placing of the appliances. Like gas, it requires no fuel storage or delivery arrangements, but it has the disadvantage of high fuel cost; also, separate appliances are required for space heating and water heating.

All these points are fully brought out in the report, which also includes valuable tables setting out the comparative costs for different fuels. Whether the price advantage shown for solid fuel is to prove sufficient to retain the domestic heating load will undoubtedly depend on the extent to which the inconveniences can be overcome. House-

*"Homes for Today and Tomorrow." Stationery Office, 4s.

holders want freedom from work and freedom from dirt and freedom from worry, and they are prepared to pay for their freedom. It is up to those who provide the appliances and the fuels to see that as far as possible they get it.

Freedom from dirt is largely a matter for appliance manufacturers and, in particular, for those engaged in research. Coal and coke are, in varying degrees, dirty by their very nature, but it is a fact that modern developments have resulted in cleaner appliances being made available and it is to be hoped that research will continue unabated. The greatest advance would probably be made if there were to be some major break-through in solving the problem of clean and simple ash removal combined with a substantial reduction in the quantity of ash; the better cleaning of coal can materially contribute towards this. The delivery of coal can prove a dirty operation; development of the packaged fuel trade is bringing about some improvement in this direction.

Freedom from work is what consumers chiefly look for and everyone concerned has an important part to play. Ignition and flexibility achieved by switch or time control provide the ideal to be aimed for; here, intensive research is taking place, and continual development is vital. Architects, builders, consumers, and fuel merchants are all keenly interested in progress being made, the coal and coke producers and distributors especially, because their future largely depends on successful research.

But in freedom from worry lies the main problem of the distributors, and the producers. It is of no use producing the ideal appliance if the fuel required is not available at the time it is required and at a price which still makes it the cheapest fuel. It is disappointing not to find greater emphasis in the report on the need for more adequate fuel storage facilities. The report rightly points out that a store for solid fuel should be convenient for the householder and accessible to the carmen without its being necessary for them to enter any part of the house or flat, but it goes on to give as the members' opinion that having regard to the other calls on space and money the present Ministry recommendations for minimum solid fuel storage can stand.

The present recommendations are 12 sq. ft. if one appliance is installed and 20 sq. ft. if there are two, or the house is in a rural area; for flats the figure is 9 sq. ft. if there is no auxiliary storage elsewhere. There is no doubt that most people who are responsible for supplying the public will consider these storage spaces to be quite inadequate. The establishment of smoke control areas and the ever-increasing demand for smokeless fuels outside controlled areas is creating greater and greater difficulties. The bulky nature of these fuels means that the consumer's store will hold a smaller tonnage, the merchant in turn finds that his stocking ground will not hold much more than half its former tonnage, and the producers are faced with the prospect of having to find more and more space to stock if they are to maintain production and satisfy the winter demand. In some cases their stocking facilities are already taxed to the limit.

But the matter does not end there. The inability of consumers to stock more fuel brings an increasing number of customers on to the market earlier each winter and for a longer period, but the distributors' transport availability per man per vehicle per day is also cut down to little more than half its previous capacity. It is a much greater question than that of enabling consumers to benefit from summer prices; it is a question of enabling them to be kept supplied at all during a severe winter. The sub-committee would not accept the recommendations of the Coal Utilisation Council—30 sq. ft. for houses—and this may well have more serious consequences in the future than are at present apparent. Apart from the difficulty of stocks and transport, there is the further complication that deliveries of less than 5 cwt. are becoming increasingly uneconomic. If a consumer cannot stock 5 cwt. of smokeless fuel and cannot obtain delivery of less than that amount, he is forced to consider packaged fuel, which many say they cannot afford, or the alternatives of gas, oil, or electricity.

It is to be hoped that those responsible for the Homes for Today and Tomorrow will not be too much influenced by the view on storage space expressed in the report, which in every other respect is a most valuable and admirable document.

Passing Thoughts . . .

NOT content with substantially raising the steel industry's costs, the Government's economic policies have resulted in the industry operating at only three quarters of its capacity. . . . The Government's decisions have operated in complete contradiction of its declared objective of expanding exports and it is small wonder that the [British Iron and Steel] Federation is moved to ask whether the steel industry can be expected to meet the challenge of the Common Market and battle successfully in world markets if its costs are artificially increased by a misguided fuel policy.—Man and Metal, the journal of the Iron and Steel Trades Confederation.

> *It cannot be said of steel as, for instance, of coal that its difficulties are self-created.—The Scotsman.*

The policy of ever higher prices to pay for higher and higher wages is just the miasma of muddleheaded theorists lacking business experience. The eggs cannot be unscrambled but high prices for coal where high prices are damaging trade can be reduced.—Letter in the Nottingham Guardian-Journal.

Furnace Closures

DECLINING DEMAND FOR BASIC IRON

RECENT closing of both furnaces at the Sheepbridge Company, Limited, Chesterfield, a member of the Stewarts and Lloyds, Limited, group, underlines the difficulties facing independent companies who are merchants selling basic iron to the steel industry. Following the post-war trend towards reducing demand because steelworks are becoming more integrated has come a sharp decline in output of crude steel which has forced several producers to close furnaces during the second half of this year.

The demand for such basic iron in 1955 was 500,000 tons a year. Today it is about 125,000 tons, and within the Stewarts and Lloyds group alone there is an estimated surplus capacity—even after the closing at the Sheepbridge Company—of about 200,000 tons annually.

At each of the Stewarts and Lloyds' group companies, Staveley Iron & Chemical Company, Limited, and the Stanton Ironworks Company, Limited, a furnace has been taken out, and the companies are working at the lowest possible occupational capacity.

Diversifying Output

Director in charge of the Stanton and Staveley group, Mr. N. C. Macdiarmid said last week that there was no immediate prospect of a further concentration of activities, but he felt there might not be a long-term future for the remaining independent merchant furnace companies. So far as the group was concerned, it was intended to extend and diversify output, especially that with a high labour content, such as high-quality castings, so that employment of the greatest number could be maintained.

The situation at Sheepbridge Company arises from the decision, announced on October 6, to close both furnaces, whose output of 300,000 tons annually of pig-iron went mainly to South Wales steelworks. Some 560 of the 800 labour force were immediately affected, but more than 200 have been absorbed into the group—including two who have gone to an associate plant in Rhodesia—and other men were found, or found for themselves, new jobs. In addition, about 40 are being temporarily kept on for clearing up work. The remainder of about 140 left the plant on November 17.

Mr. Macdiarmid said the group did not intend to allow the value of the Sheepbridge Company's 175-acre site to be lost, and talks had been held with Chesterfield Corporation. As a result, it might be that a demand for the land would arise from another industry. So far as the plant itself was concerned, it was possible to "cannibalize" blast-furnace plant, and this was being considered.

As regards the Stanton and Staveley companies, demand for pipes was reasonably active and would improve if the credit restrictions were relaxed in the New Year and local authorities were able to go ahead with new schemes. General foundry business was suffering from the lower activity in industry, but that also could be expected to improve with any general improvement.

Steel Production in November

IMPROVEMENT in steel production in November is reported by the Iron and Steel Board in its monthly statement issued yesterday (Thursday). Output was at an average rate of 420,200 tons a week, representing the use of 79 per cent. of capacity. The November rate was 5 per cent. greater than in September (production in October was affected by the labour dispute in South Wales), but 17 per cent. below that for November, 1960.

The annual rate of steel production during the first 11 months of 1961 was 22,400,000 tons. With the expected seasonal fall in December, the total for the year may prove to be a little less, possibly 22,250,000 tons, the board estimates.

The fall in production below the range of 24,000,000-25,000,000 tons estimated earlier in the year results very largely from the heavy withdrawals from stocks which have been taking place since the early summer. Of the other elements in the demand for steel, home use has fallen only slightly below the estimate for the second half of the year, while exports of steel have been well maintained and may exceed the 1960 total of 4,080,000 tons.

Latest pig-iron and steel output figures (in tons), with the corresponding 1960 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1961—September ..	260,700	13,554,000	400,200	20,811,000
October ..	248,300	12,914,000	382,200	19,872,000
November ..	269,600	14,018,000	420,200	21,851,000
1st 11 months	286,400	14,895,000	430,400	22,381,000
1960—September ..	305,800	15,900,000	481,000	25,012,000
October ..	313,900	16,321,000	497,000	25,842,000
November ..	315,000	16,382,000	504,500	26,234,000
1st 11 months	302,900	15,750,000	468,800	24,376,000

NORMAL WORKING was resumed on Monday at Cynheidre Colliery, Llanelly (Carm), after a dispute which affected production towards the end of last week. Fourteen faceworkers had stayed underground overnight following a shift, in protest against an arbitration award.

Appointments

Consultant to Rhymney Engineering Company

FORMERLY Area general manager of the No. 4 (Aberdare) Area, South-Western Divisional Coal Board, Mr. J. A. HAYES, who retired at the end of March, has been appointed consultant to the Rhymney Engineering Company, Limited, for mining equipment and colliery reorganization.

MR. J. A. HAYES

Mr. Hayes, who retired at the end of March, had been Area general manager since 1953. His first mining appointment was with the Babbington Coal Company in 1917, and from 1930 until 1939 he was overman and development engineer at Thoresby Colliery, for the Bolsover Colliery Company, Limited. On nationalization Mr. Hayes joined the East Midlands Division of the NCB, first as No. 3 Area planning and development engineer and later as sub-Area manager and assistant production director.

MR. P. R. MILLIGAN has been appointed secretary of Richard Johnson & Nephew, Limited, iron, steel, copper, and aluminium wiredrawers and rollers, etc., of Bradford.

Mr. R. E. PURDHAM has been appointed chief engineer and a member of the executive of Baker Perkins, Limited, manufacturing engineers, iron and steel founders, etc., of Hebburn-on-Tyne (Co. Durham).

For the past four years manager of Whitwell Colliery, near Worksop (Notts), Mr. L. E. FLETCHER has been promoted group manager of the No. 1 (Chesterfield) Area, East Midlands Divisional Coal Board. Before managing Whitwell, Mr. Fletcher held similar appointments at Parkhouse, Grassmoor, and Williamthorpe Collieries, in the same Area.

At present engineer-in-charge of the mechanical research and development department at C. A. Parsons & Company Limited, Mr. P. MCGREGOR ROSS becomes chief development engineer in charge of the engineering development design office of the research and development organization of Tube Investments, Limited, on January 1. He will be responsible for the specialized engineering involved in improving and developing process plant to meet the advancing requirements of TI. The new office is being established at Bournemouth.

Coal Price Rise Proposals

PROPOSALS of the National Coal Board to raise the price of certain industrial coals by amounts up to 20s. a ton were considered at a three-hour meeting in London on Tuesday of the Industrial Coal Consumers' Council.

No statement was issued afterwards, but it is understood the members agreed that certain views should be put to the Minister of Power, Mr. Richard Wood.

NCB Self-financing in Two Years?

THERE is a possibility of the National Coal Board becoming self-financing within the next two years, Lord Robens, NCB chairman, said on Tuesday. Delivering the annual Dallas lecture to Glasgow Junior Chamber of Commerce, he said: "Bearing in mind the size of this industry, its target of 200,000,000 tons a year, and having in mind all the time that any extractive industry must always be spending money on development, it would seem to us that with an investment of something like £80,000,000 to £85,000,000 a year, we should maintain efficiency and this capacity of 200,000,000 tons. I am hoping that within two years, we shall be able to find this from our own resources."

Lord Robens said that Rothes Colliery, started 14 years ago at Fife at a cost of more than £8,000,000, had almost exhausted its coal resources. If it were to continue production, another £5,000,000 or £6,000,000 would have to be invested in it. "No decision has been made about closing down Rothes, but it is under very strong inquiry at the present time."

Emphasizing the need for further mechanization in the pits, he said that recently new records had been created week after week, and output per manshift for the whole of the UK had reached the record level of 30 cwt. per man, and had been at that level for the past eight weeks. The installation of machines was continuing apace, and last week 52 per cent. of all British coal was power loaded. "Our highest expectations have been exceeded." These figures, Lord Robens said, showed that the industry had got a new life and was determined to succeed. Next year's programme would be just as big.

Much work was being done in applying the latest scientific discoveries to the mining of coal, and electronic engineers were required in ever increasing quantities. At that moment there was a coal face being worked at a pit in this country without the use of a man on the machine at all. It was cutting coal direct from the spray-back from gamma rays.

"And while this is in its infant stage—there are many technical problems to be overcome—the day will come when men's lives need not be risked unduly at the coal face where about 50 per cent. of the accidents occur. The miner will be able to operate his machine from the comparative safety of the roadway (underground) by the use of electronics and remote control," Lord Robens concluded.

Radio Control for Durham Pit Traffic

TWO-WAY radios are being fitted to underground locomotives at Easington Colliery (Co. Durham), in an endeavour to secure more efficient control of traffic in the mine. Drivers will be in direct contact with the surface, so that the underground locomotives can be directed to the most useful work in their area.

Idea behind this latest experiment by the National Coal Board is to speed up coal production. If it is successful, the scheme may be applied to other collieries.

DAMAGES OF £225 were awarded at Whitehaven County Court to Mr. James Rothery, who was injured in an accident at Haig Pit when a compressed air valve blew off. Judge Maddocks said the accident was due entirely to the failure of some servant of the National Coal Board to fix the valve.

Safety Pays

EXCELLENT RESULTS OF DURHAM CAMPAIGN

IF fatalities in the Durham coalfield had continued through 1959-60 and 1960 to the present day at the 1958 fatal accident rate, it was estimated that 117 miners would have died. The total in fact was 62, a saving of 55 lives. "That is a solid achievement, but it is not nearly good enough and leaves no ground for complacency," said Dr. William Reid, chairman of the Durham Divisional Coal Board, addressing a meeting in Durham on Saturday of representatives of the board, the executive of the Durham Area of the NUM, the NACM, and of colliery consultative committees from Nos. 1, 2, and 6 Areas.

The meeting was called to consider progress in the board's drive for greater safety in the coalfield and the programme for the coming year, and Dr. Reid said that when the Greater Safety campaign was inaugurated four years ago miracles were not expected, but it was a simple, undeniable fact that the fatal accident rate had been reduced since then. In Durham it had dropped from 0.14 per 100,000 manshifts to 0.08, compared with the national rate of 0.17.

That improvement had not come about by just good luck, the chairman said, suggesting it was due to growing interest in accident prevention stimulated by the board's campaign, by officials and men alike. "Keener observation, operational control, attention to detail by all concerned and the taking of fewer chances are paying dividends," he maintained.

Constant Action Needed

Dealing with reportable non-fatal accidents, Dr. Reid said the rate in 1959 was 0.90 per 100,000 manshifts, in 1960 it was 0.88 and the improvement had continued this year to date, being 0.81 at the end of November. This, again, was better than the national average, which was 1.09 at the end of October. The improvement achieved must be continued, he emphasized. Some pits had achieved a high standard of safety, but constant action was needed everywhere both underground and on the surface, because no pit was perfect.

A message, specially tape-recorded by Lord Robens, chairman of the NCB, and relayed to the meeting, stated that on any basis of comparison there could be no doubt that the safety record in the coal industry was worse than that of any other major industry; even normal commonsense and a regard for regulations could bring a big improvement. The National Safety Year, which the industry had decided to launch in 1962, needed a genuine effort by management and men to show real and positive results.

"I know that in Durham I am preaching to the converted," said Lord Robens. "The examples of the improvements that have been made in Durham show what can be achieved. Already you have one of the best records in the country. This is the result of a splendid co-operative effort between unions, management, and men, right down the line. I want to congratulate you."

FACTORY WHICH will employ 200 men is to be built at Hendon, Sunderland, by Megator Pumps & Compressors, Limited, London, W.1. It is due to start production in the spring of 1963.

Smokeless Coal Plant at Comrie

APPLICATION by the National Carbonising Company, Limited, was made last Friday to the Fife County Council for permission to build a carbonization plant for the production of Rexco at Comrie Colliery, near Oakley, Dumfermline. If permission is granted and current negotiations with the NCB are successful, construction of the plant could begin as early as February next year and the production of Rexco early in 1963. Supplies of the fuel in Scotland are small and a new plant at Comrie is essential if the position is to be improved.

Main contractors for the building of the plant will be Newton, Chambers & Company, Limited, Sheffield, which built the extension to the original Mansfield plant in 1952, the main plant at Edwinstone in 1956, and its extension in 1959. At Thoresby, production exceeds 200,000 tons, and the new Scottish plant will probably be about half that size.

Asked why the company had chosen Comrie Colliery and Scotland for its new plant, Mr. John Brown, general manager, said: "There is a serious shortage of reactive solid smokeless fuel in Scotland and the most economical way of extending the supply position is to produce it on the spot. Comrie Colliery was chosen because it is one of the very few mines in Scotland with adequate tonnage and quality of non-coking coal.

More Pits Reach 1,000,000 Tons Target

FOURTH Nottinghamshire pit to reach the 1,000,000 tons output target this year is Newstead Colliery, an 87-year-old pit modernized at a cost of £1,700,000. Its production represents 73½ cwt. for every shift worked.

One of Britain's largest collieries, Brodsworth Main, near Doncaster (Yorks), has also mined 1,000,000 tons this year, but with greatly increased mechanization, the figure should be reached much sooner in 1962.

In the No. 2 mid-East Durham Area of the Durham Division, Dawdon Colliery reached the 1,000,000-ton mark last week and achieved the best annual figure in the pit's 54 years' history. The previous best was 994,116 tons in 1930. Seven of the 14 pits in the Area passed their target figures.

Board Changes

Assistant Managing Directors for RTB

PRODUCTION controller since 1958 and a director since 1959, Mr. W. F. Gilbertson, has been appointed assistant managing director (production) of RICHARD THOMAS & BALDWINS, LIMITED. Mr. J. Idris Roberts, director and secretary, becomes assistant managing director (finance and administration).

MR. W. F. GILBERTSON

Mr. Gilbertson joined the family tinplate firm of W. Gilbertson & Company, Limited, in 1929, and was appointed assistant general manager of the Kings Dock and Elba Tinplate works of Baldwins, Limited, in 1942. He took charge of all RTB tinplate works in West Wales in 1945 and, after further promotions, moved to the London head office as executive assistant to the managing director in 1957.

Mr. Roberts joined the special accounts department of Richard Thomas & Company, Limited, in 1925. In 1935 he was appointed joint secretary of the company. Following the merger with Baldwins in 1945 he became personal assistant to the chairman, continuing as joint secretary. He was appointed secretary and comptroller of RTB in 1954 and joined the board in 1957.

BRITISH STEEL CONSTRUCTIONS (BIRMINGHAM), LIMITED—Mr. R. D. Lapham has been appointed a director.

AITON & COMPANY, LIMITED—Mr. R. E. Leapingwell has resigned from the board and severed his connection with the company.

ELDON HILL QUARRIES, LIMITED—Mr. Eric Askey has been appointed a director of the company, and of Derbyshire Mineral Mines, Limited. Both are subsidiaries of Thos. W. Ward, Limited.

NEEPSEND STEEL & TOOL CORPORATION, LIMITED—Mr. Stanley L. Speight has joined the board as export director. Previously he has concentrated on the export side of the subsidiary, Jonas & Colver (Novo), Limited.

RUSTON & HORNSBY, LIMITED—Managing director of the company, Mr. V. R. Prehn, is to retire on December 31. He will be succeeded by Mr. C. T. Alderson who, since the beginning of this year, has been deputy managing director.

BROOK MOTORS, LIMITED—Mr. Michael J. L. Brook has been co-opted on to the board as production director. He is the grandson of the late Ernest Brook, founder of the firm, and also son of the present managing director.

BRITON FERRY STEEL COMPANY, LIMITED—Col. J. M. Bevan has retired from the chairmanship of the company and also as chairman of Neath Steel Sheet & Galvanizing Company, Limited. He has been appointed honorary president of both companies. He joined the board of Briton Ferry in 1911, was appointed managing director in 1924, and elected chairman three years later. He is succeeded as chairman of both companies by Mr. K. M. Jones, who retired in 1958 as managing director of Briton Ferry. Mr. Jones was appointed chairman of the Llanelly Steel Company, Limited, a year ago.

NORTH BRITISH RUBBER COMPANY, LIMITED—Mr. H. E. Humphreys, Jr., is to resign his chairmanship of the company from December 31. He will be succeeded by Mr. G. R. Vila, who is president of the United States Rubber Company, to which the Scottish firm is affiliated. Mr. Humphreys is chairman of the US concern.

CHURCHILL GEAR MACHINES, LIMITED—Mr. C. R. Tearne has been appointed a director of the company, a subsidiary of Charles Churchill & Company, Limited. Mr. T. W. Lindsay has been appointed a director of H. & D. Churchill, Limited, another subsidiary.

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—Mr. W. C. Sproson is to resign as chairman on January 31, but will remain on the board. Mr. Robert Whitehead, who was chairman until 1955, is to assume the office on February 1 for a period not exceeding two years.

BARROW HAEMATITE STEEL COMPANY, LIMITED—Mr. L. S. Carstairs has been appointed chairman, and Mr. J. K. Howarth, managing director of the company, a subsidiary of Arusha Industries, Limited. Capt. G. E. Coles resigned as chairman and from the board of the subsidiary last October.

URQUHARTS (1926), LIMITED—After 36 years' service with the company, Mr. R. H. G. Sutton is retiring at the end of the year from the managing directorship. He will be succeeded as managing director by Dr. W. H. Wheeler. Mr. Sutton will remain deputy chairman and will also continue as technical adviser to the British Oil Burner Manufacturers' Association.

SPELTHORNE METALS, LIMITED—Mr. G. C. Ivess, managing director of the company, a member of the Berger Jenson & Nicholson, Limited, group, has been seconded to Montreal for a year to take over the management of Jenson & Nicholson (Canada), Limited. He left the UK to take up the appointment on Wednesday. During his absence, Mr. H. A. Newman will act as chief executive of Spelthorne Metals.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED—Mr. P. C. Allen is relinquishing his appointment as president of the subsidiary, Canadian Industries, Limited, on March 1, 1962, and will be returning to the UK to resume his duties as an executive director of the parent company. He will become oversea director responsible for western Europe. Mr. Allen will remain on the board of Canadian Industries as non-executive chairman. Mr. L. Hynes has been appointed president and chairman, and Mr. W. T. D. Ross vice-chairman, of the executive committee of Canadian Industries with effect from March 1.

PRICE OF TITANIUM CUT BY ICI

PRICE of wrought titanium products is to be cut by the metals division of Imperial Chemical Industries, Limited, by an average of 10 to 15 per cent. from January 1. This step follows a similar price-reduction announced last week by Jessop-Saville, Limited, a member of the Birmingham Small Arms Company, Limited, group.

Jessop-Saville and ICI are the UK's only producers of wrought titanium products, which are then sold to a number of fabricators making finished goods. The price of titanium has now been cut six times by each company since selling began in 1954-55.

Burden of Taxation

HALVES RECORD PROFITS OF STEEL FIRM

REFERRING to the burden of taxation on British industry, Mr. Frank A. Hurst, chairman of Samuel Osborn & Company, Limited, manufacturers of special steels, etc., of Sheffield, says: "I am still disappointed that those in authority continue to criticize British management and at the same time fail to do anything to curb the extravagant national expenditure, which could do much to help us meet increasing world competition by a reduction in taxation."

In his annual statement for the trading year to July 31, 1961, Mr. Hurst points out that record profits for the year of £2,025,858 were reduced by tax to £976,900. Tax in the UK took £972,000 and overseas £65,773. These first charges on profits reduced the total by about 51 per cent., and the figures thus showed the exceedingly heavy burden which had to be carried.

Mr. Hurst says that during the year direct exports improved, but the company is continuing to strive for further achievement. A large percentage of products sold in the home market, he adds, goes towards the making of other British products which are ultimately exported. The purchasing side of the business had made a contribution towards the company's success by the exercise of careful contracting.

Government's "Deaf Ear"

Dealing with the question of protection against dumping, Mr. Hurst says that while ready to criticize the efforts of manufacturers, the Government, when faced with this simple problem, "continues to turn a deaf ear and professes to know better than those it criticizes." At the same time, Mr. Hurst goes on, the Government deplores the gap in our balance of payments, which is widened by dumping. "Other Governments are apparently more ready to aid their manufacturers," he says, and again advocates the need for quick measures to implement the provisions of the Customs Duties (Dumping and Subsidies) Act, 1957, when necessary.

On the European Common Market, the chairman says that while he is anxious that the Commonwealth should be protected in any arrangement with the Six, some Commonwealth countries must not look on the Commonwealth as a "one-way street." If they wish to continue exporting goods to us on Imperial Preference terms, they should not impose harsh restrictions on British attempts to export goods to them, whether by restrictions of imports, the imposition of high duties, or the narrowing of preference tariff margins in favour of outside competitors.

PRICE CHANGES OF HIGH SPEED STEEL BLACK BARS

VARIATIONS, which came into effect on December 7, in the recommended basis prices of high speed steel black bars are announced by the High Speed Steel Association. The new prices per lb. are as follows:—

Finished bars, 5 per cent. cobalt, 10s. 4d.; 14 per cent. tungsten, 6s. 6½d.; 18 per cent. tungsten, 7s. 3d.; 22 per cent. tungsten, 8s. 7d.; 4/6 quality molybdenum tungsten, 6s. 2d.; 6/6 quality molybdenum tungsten, 6s. 4d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 6d. per lb.

Cost to Industry of 40-hour Week

SHORTENING of the working week to 40 hours without loss of earnings would result in an increase of more than five per cent. in wage costs if the hours by which the normal week was to be reduced continued to be worked at overtime rates. This is stated in a report of the British Institute of Management, which held a conference in London recently on the implications of shorter working hours.

The report says that out of the 13,000,000 wage-earners in Britain more than 60 per cent. now work a normal week of 42 hours or less, and only 29 per cent. work for 44 hours or more, compared with a 40-hour week or less worked in Australia, Canada, New Zealand, and the United States, and a reduction in the British working week to 40 hours would have to be paid for, at least in part, by increased productivity.

The shortness of the day and week seemed to justify a re-examination of the time lost by tea breaks, and closer observance of starting and stopping times was essential. "Shorter hours justify a more intense effort while at work than in the past age of a longer working week and earlier school leaving, when tea breaks and rest pauses were desirable features in a long working day."

Mr. Hugh Clegg, Fellow of Nuffield College, Oxford, said that the amount of new capital required to re-equip British industry would be very much less if all the new plant was used continuously. To do so, he suggested a 36-hour week, worked over six shifts of six hours each.

Steel Firm's Impressive Education Record

APPRENTICE employees of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, at Rotherham, gained 482 examination successes during the year, compared with 288 last year. Commenting on the firm's impressive record in the field of industrial education, Mr. Raymond Winder, the company's education officer, said: "it augurs well for our future, particularly if this country joins the Common Market."

He went on, "Success will depend not only on the company having the most modern equipment and techniques, but also on the way in which all employees work, both efficiently and economically." The "Young" cup, for the best all-round craft apprentice, went to 20-year-old Brian M. Williamson, whose father is also employed by the firm. Last year one in 19 of the firm's employees obtained an examination certificate and one in 13 followed a course of study.

In Parliament

More Remploy Works Urged for Disabled Miners

BUILDING of more Remploy factories to cater for disabled miners made redundant as a result of mine closures was urged by MR. ROY MASON (Lab.) and other Opposition speakers. MR. JOHN HARE, Minister of Labour, replied that if there were any disabled miners for whom the National Coal Board could not provide other employment, his disablement resettlement officers would give every assistance in finding work. Very few miners with disabilities would, however, be likely to be in need of employment in Remploy factories, which were reserved for those so severely disabled as to be unlikely to obtain employment under ordinary conditions.

MR. MASON said that about 200 pits were to be closed in the next five years, and many of the industrially disabled and diseased could not go to other collieries because these already had their quota, and factories would not take them. Remploy seemed to be the best likely intake, but it would require much more finance than had so far been given for Remploy.

MR. HARE said he was keeping in close touch with the National Coal Board on the matter. The board expected to absorb elsewhere some of these men close to their place of work, and most of the men whose pits would be closed in 1962. He was anxious to see that these men were given a proper chance. In reply to MR. R. E. PRENTICE (Lab.), the Minister denied he was contemplating cuts in the estimates for Remploy factories and Government training centres. "In fact, we are increasing the amount of money to be made available," he said.

WILL COAL INDUSTRY EVER BREAK EVEN?

MOVING the second reading of the Coal Industry Bill in the House of Lords on Tuesday, LORD MILLS, Minister without Portfolio, said it enabled the National Coal Board to be financed in the matter of its deficit while basic problems were studied. The indications were that the accumulated deficit could reach £90,000,000 to £95,000,000 this year and the only feasible course was to provide Exchequer funds while a full appraisal of the board's activities was undertaken.

Apart from 1947 the board had made an operating profit of between £17,000,000 and £23,000,000 a year, said LORD SHEPHERD. Why did these deficits continue to appear? he asked. He thought it was because of the manner in which the financial arrangements were made when the industry was nationalized and that this would have to be reviewed.

The industry's interest was £15,000,000 in 1948 but had risen to £41,000,000 last year. He submitted that no matter how hard the miners worked or what ingenuity the NCB put into selling coal, the industry would never break even because interest on capital was so great.

Lord Mills agreed that there had been an operating profit, but emphasized that it was without interest.

STEEL PRODUCTION

MR. MICHAEL FOOT (Lab.) asked the Chancellor what estimates had been made of steel production required in order to fulfil the British contribution towards the 60 per cent. growth between 1960 and 1970 in real gross national product, approved recently by the Organisation for European Co-operation and Development.

In a written reply, MR. HENRY BROOKE, Chief Secretary to the Treasury, said the 50 per cent. growth was a collective target for all membership countries taken together. The Iron and Steel Board's 1961 special report on development in the industry estimated probable steel demand at 29,000,000 tons in 1965 and 32,000,000 tons in 1970. To allow for possible variations in demand, the appropriate production capacities were assessed at 32,000,000 tons in 1965, and 35,000,000 to 36,000,000 tons in 1970, compared with about 29,000,000 tons in 1962.

IN REPLY TO Mr. Norman Pentland (Lab.) the Parliamentary Secretary for Science said investigation into the manufacturer of a lightweight aggregate for concrete from pulverized fuel ash produced by coal-fired power stations was being done by the Department of Scientific and Industrial Research.

SIZE OF THE general factory inspectorate is to be increased by the addition of another 34 inspectors and 60 other staff, the Minister of Labour said in a written reply to Mr. William Carr (Con.) The Minister said the changes had been made with particular regard to the position of the construction industries.

TO WHAT EXTENT did the Minister of Power encourage scientific research in the coal-mining industry, Mr. Emrys Hughes (Lab.) asked. The Minister replied that the industry's general research and development programme was considered by him, with the help of his Advisory Council on Research and Development, and he had told the NCB that he was pleased to see the emphasis given in its programme to work directed to increasing productivity in coal mining.

J. H. Fenner Research Centre Opened

OFFICIAL opening by the chairman of the National Coal Board, Lord Robens, of the new Hainsworth research centre erected by power transmission engineers, J. H. Fenner & Company, Limited, on a site facing its Hull factory and headquarters, takes place today (Friday). The building, which has a number of novel features in its design, covers a total floor area of 38,000 sq. ft.

The centre provides full research facilities for all the companies in the Fenner group, including subsidiaries manufacturing oilseals and mining equipment. Products developed and tested include synthetic rubber seals for use in machinery, aircraft, and motor vehicles, in addition to flameproof colliery conveyor belting, hydraulic roof supports, idler rollers, and conveyor belt jointing equipment for the National Coal Board. Here, also, research will continue into Fenner mechanical power transmission products of the future.

The centre has been named after Mr. S. B. Hainsworth, the chairman and managing director of the Fenner group, who joined the company as manager of the weaving department in 1921. When he became managing director in 1945, the company had been built up to a capital of £250,000 and the previous year's profit was £91,000. Today, the capital and reserves have increased to over £2,000,000 and the profit for 1960 was £909,000. The opening also coincides with the Fenner centenary year.

ABERNANT COLLIERY

"Will More Than Meet its Obligations"

ABERNANT Colliery, the new £10,000,000 pit in the Amman Valley, West Wales, about which questions were asked in Parliament last July, is rapidly approaching the final stages of construction and development, and "will more than meet its obligations to industry and the nation." This was stated last week by Mr. C. Round, Area general manager of the No. 9 (Neath) Area of the South-Western Divisional Coal Board, who referred to "much public and other comment, often ill-informed and speculative," which had created unfortunate impressions about the future of the colliery.

Reporting about progress at Abernant at a meeting of Ammanford Employment Committee, Mr. Round said that the coal preparation plant had been put to work and was operating well. Difficulties associated with the north shaft had now been overcome, and this was facilitating the build-up of output and underground development. "Difficult problems of integrating labour from collieries operating under different mining conditions have been met and are rapidly being overcome," he added

Speaking of the West Wales anthracite coalfield, Mr. Round said this was probably the most difficult of all coalfields in the United Kingdom. Many problems of a psychological and a physical nature had been resolved, but much remained to be done.

Pits in Amman Valley

"There is little doubt that technically the coalfield can be developed into a highly economic unit of the South-Western Division," he said. Mining conditions were variable; in some cases quite good and in others exceedingly difficult. Geological and other disturbances in the way of faults, washouts, thinning of seam sections, water and gas, were frequently encountered.

On the progress and prospects of various collieries in the Amman Valley, he said that at the Wernos Colliery, Ammanford, a new and greatly modernized system had been developed to meet the special circumstances and the high inclination, of the workings. The effect had been to increase the colliery's capacity from about 600 tons to 2,700 tons a day.

Pantyffynnon Colliery, Ammanford, had substantially improved its performance and was now operating economically. Output had been increased by 16,212 tons to 114,295 tons for the year to date, and overall productivity from 20.3 cwt. to 22.7 cwt. per manshift. Good progress had been made at Ammanford Colliery in recent weeks, with encouraging prospects of it becoming an economic and successful unit.

At Cwmgorse Colliery the remaining reserves of coal would be worked out in the next two years, and it was planned to transfer personnel to Abernant. The East pit, Gwauncaegurwen, had experienced severe mining conditions and reserves were reaching the point of near exhaustion. During the year 85 men had been transferred to Abernant, and further transfers were projected in the next few years pending the full closure of Gwauncaegurwen.

Mr. Round said that there were extensive coal reserves available in Amman Valley, those at Abernant alone being assessed at more than 100,000,000 tons. Reserves were available for the development of new mines to meet the needs of the far-distant future, but heavy manpower would be required to meet present and future commitments, and the further development of collieries in the Valley.

The question of the output target at Abernant, together with that of Cynheidre, the other new anthracite pit in West Wales, was raised in July by Mr. Donald Box, MP for Cardiff North. In a letter to Mr. Box Lord Robens, chairman of the National Coal Board, said that the board expected about 50,000 tons to be produced this year at Abernant, but the authorization for the colliery was based on an ultimate output of 720,000 tons.

Lord Robens has also written recently to Mr. Box about the future of Nantgarw Colliery, Taffs Well (Glam). Lord Robens said: "The pit is under inquiry and until this is completed I do not propose to issue any detailed figures." The colliery, he added, was a pre-vesting day scheme originally planned for an annual output of 750,000 tons approved by the Ministry of Fuel and Power on the basis of proposals submitted before vesting day by the private owners.

"The results have been disappointing, but the services are in a troubled geological area and as a result these early expectations have not been realized," said Lord Robens.

Pit Closures not Dictated by Politics—Lord Robens

REPLYING to a letter from Bowhill Colliery (Fife) branch of the National Union of Mineworkers condemning the Coal Board's policy on pit closures, Lord Robens, NCB chairman, points out that nothing can be done to save pits at which workable reserves are almost exhausted, and of the recent closures proposed in Scotland nine are in this position.

Of the others, says Lord Robens, one is being closed only temporarily for a new development to produce coal for a new power station, one is being partially closed only, and five are collieries where future working is bound to be uneconomic and where manpower can be more productively employed at neighbouring pits. The closure of Glenochil pit only could be considered as unexpected, and this was a case of a disappointment that sometimes inevitably occurred in mining in difficult and disturbed areas of coal.

Answering a suggestion in the letter that he should resign "rather than carry out Tory policy," Lord Robens says the steps which have had to be taken were to a large extent inevitable. "My resignation would not alter these inescapable facts, and, indeed, would be an empty gesture. To talk about carrying out Tory policy is quite absurd. These matters are dictated by the exigencies of mining, and have nothing whatever to do with political policy."

Obituary

MR. D. N. GRIFFITHS

FORMER principal of Wandsworth Technical College, Mr. David Nathaniel Griffiths has died at the age of 81. Educated at Llandovery College, he was an engineering pupil at the Dowlais plant of Guest, Keen & Nettlefolds, Limited, from 1898 to 1904, and after three years as an assistant engineer at Cammell Laird's works at Workington, he was appointed head of the engineering department of Darlington Technical College.

Mr. Griffiths went to Verdin Technical School, Northwich, as principal in 1913 and to Wandsworth in 1921.

MR. JOHN CHARLES HALL, director and chief engineer of the Tees Side Bridge & Engineering Works, Limited, Middlesbrough, has died after a short illness. Mr. Hall joined the firm in 1926 and became a director last July.

MR. RONALD SIMPSON, who has died suddenly at the age of 44, was secretary and chief accountant of the Hunslett Engine Company, Limited, Leeds, and also of the parent company, Hunslett Holdings, Limited.

The death has taken place of Mr. JOHN BRASS, a past president of the Institution of Mining Engineers, a former chairman of the South Yorkshire Coal Owners' Association, and a member of the National Association of Colliery Managers for many years. He was 82.

Managing director of Steelway, Limited, manufacturers of steel flooring and steel treads, of Wolverhampton (Staffs), until his retirement eight years ago, Mr. FREDERICK HAMMOND has died at his Brewood (Staffs), home. He was 67. Mr. Hammond joined the company shortly after it was founded, in 1928, and was responsible for much of its development.

The death has taken place of Mr. LAURENCE EDGAR, who joined John Thompson, Limited, engineers, boilermakers, etc., of Wolverhampton, in April, 1955, as group publicity manager, and built up a department to serve the John Thompson group companies in all branches of publicity. Some three years later, ill health prevented him from continuing in a full-time capacity, but he was able to work on special assignments and in an advisory capacity.

GKN and Delta Metal in "Mutual Interest" Talks

CONVERSATIONS are taking place between Guest, Keen & Nettlefolds, Limited, and the Delta Metal Company, Limited, for the furtherance of their "mutual interests" with regard to their respective subsidiaries, United Non-Ferrous Metals, Limited, and Davis & Timmins, Limited. No material changes are envisaged by the two boards, either in the management or general trading policies of either of these two companies.

United Non-Ferrous Metals manufactures metal rods, and Davis & Timmins specializes in screws, bolts and nuts. In a share-exchange offer worth about £6,000,000 last June, Delta Metal acquired the outstanding 80 per cent. of the share capital of Davis & Timmins not then held by it. A further statement is expected shortly.

Less Demand for Steel Products of Dorman Long

FALLING-OFF in demand for steel products has been experienced during the past year by Dorman Long & Company, Limited, despite an increased volume of work obtained by its structural engineering subsidiaries against keen competition. This is stated by Mr. E. T. Judge, chairman, in the current issue of Dorman Long Illustrated.

In a foreword to a review of the group's activities, Mr. Judge says that a return to a more satisfactory and sustained level of operations depends largely upon improving further the group's competitive strength, and work is proceeding on the initial stages of another development programme.

The company announced another shut-down on Tees-side where it forms a major part of the local iron and steel industry. One of the melting shops in the Cleveland Works, Middlesbrough is to close early in the New Year. The reason is said to be a fall in demand for steel and the resultant build-up in stocks of ingots. It is not yet known if any of the 500 workers affected will be switched to other jobs.

This is the fifth partial shut-down of various sections of Dorman Long works on Tees-side in recent months. Four steel furnaces, including two at Cleveland Works have been temporarily closed. In addition shifts have been cut at the Redcar and Britannia works.

Recent Wills

SHAW, JAMES, former chairman of Allied Ironfounders, Limited £16,437

PICKLES, R. H., director of John Pickles & Son (Engineers), Limited, Hebden Bridge (Yorks) £23,907

WILKINSON, GRANVILLE, managing director of E. & W. H. Haley, Limited, ironfounders, of Bradford (Yorks) £4,218

BARTRAM, G. H., director for 37 years of the Sunderland shipbuilding firm of Bartram & Sons, Limited £32,896

BARKER, HAROLD, managing director of A. & H. Barker, Limited, sheet metal workers, of Hebden Bridge (Yorks) £34,521

PHILLIPS, LT.-COL. N. C., chairman of Wolseley Engineering, Limited, and a director of Wolseley-Hughes, Limited £21,328

JONES, L. M., managing director of Samuel Jones & Company, Limited, engineers, and non-ferrous founders, of London, S.E.15 ... ... £81,790

HALL, EDWIN, Lancashire Area secretary of the National Union of Mineworkers, until his retirement in November last year £3,417

BRAHAMS, HARRY, director and founder of H. Brahams & Company, Limited, scrap metal merchants, of Bury St. Edmunds (Suffolk) £116,334

SUTTON, A. H., retired colliery overman, past president of the National Association of Colliery Overmen, Deputies, and Shotfirers £4,307

HARDWICK, G. F., managing director of G. F. Hardwick, Limited, manufacturers of diesel engines, etc., of Doncaster (Yorks) £14,679

RUTHERFORD, R. P., governing director of A. Rutherford & Company, Limited, marine engineers and shiprepairers, of Birkenhead (Ches) £118,415

OGLE, ALFRED, formerly managing director of G. C. Ogle & Sons, Limited, agricultural engineers and ironfounders, of Ripley, near Derby £28,907

MATHER, J. C., deputy chairman, and formerly chairman of Cammell Laird & Company, Limited, and a director of several other companies £39,654

WHITELEY, L. G., managing director of William Newsome & Son, Limited, engineers and machinery merchants, of Sowerby Bridge (Yorks) £3,411

CRYER, L. H., secretary of the National Federation of Scrap Iron, Steel, and Metal Merchants, and for many years with the Ministry of Supply ... £6,159

OXYGEN CONTENT OF BASIC CONVERTER STEEL

Changes During the Blow

Studies on an experimental converter are described by the authors, W. A. Fischer and H. Straube, in this article, the first part of which was published in our last issue (p. 1227). The paper was translated from Stahl und Eisen, 18, 80, September, 1960 (pp. 1194-1206).

Influence of the Oxygen in the Metal on the Main Associated Elements of the Iron

BEHAVIOUR of the main elements accompanying the iron is decisively influenced by the oxygen content of the iron. From comparison of the oxygen development with the variation in the other elements accompanying the iron, according to the course of the blow, characteristic changes in the latter were accordingly to be expected as a result of the oxygen hump found.

Oxygen and Carbon

In Fig. 14, the oxygen concentrations of all the suction samples are plotted against the related carbon concentrations. Furthermore, the equilibrium curve is plotted for the mean temperature course of all the melts with reference to the carbon-dioxide component in the gas phase, calculated according to S. Marshall and J. Chipman[25], corresponding to the gas analyses obtained for $p_{CO} + p_{CO_2} = 0.4$ atm. The range of scatter of the oxygen content lies far above the equilibrium curve for higher carbon content. With a further reduction in the carbon, the approach to the equilibrium curve is closer, until finally, it reaches the curve and even drops beneath it, with the lowest carbon values found. It must be reckoned, however, that for low-carbon concentrations, *i.e.*, after the transition, the partial pressure of the carbon dioxide decreases very considerably, and the equilibrium curve is similarly displaced towards a lower oxygen concentration. The fact that, with these low concentrations, the carbon has lost its original, dominant influence on the value of the oxygen concentration is more important, however, since the influence of the slag now predominates.

Fig. 15(*a*) shows a comparison of the change in the carbon and oxygen concentrations during the course of a blow. Up to the transition point, with a high elimination rate, the carbon increases approximately linearly. The rapid rise in the oxygen content already begins towards the end of this period. After the transition, the rate of elimination of the carbon decreases only very gradually.

The logarithmic curve of the mean values of the oxygen and carbon contents in Fig. 15(*b*) clearly shows that the end of the drop in the carbon concentration corresponds on the time scale with the peak value of the oxygen hump. Thus the oxygen concentration of the metal still acts on the carbon concentration in the iron even during the dephosphorizing phase. During the period of the sharp rise in the oxygen curve, progressively

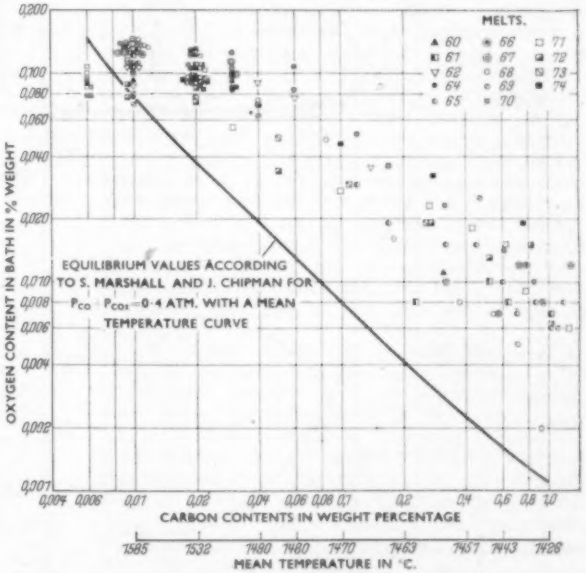

FIG. 14.—CARBON AND OXYGEN CONTENTS IN THE METAL BATH IN THE BLOWING EXPERIMENTAL CONVERTER. CARBON CONTENTS IN WEIGHT PERCENTAGE. MEAN TEMPERATURE IN DEG. C. OXYGEN CONTENT IN BATH IN PERCENTAGE WEIGHT.

smaller amounts of carbon monoxide are evolved and the carbon content decreases. Not until the abrupt reduction in the oxygen content is the reduction in the carbon content so diminished that it is no longer perceptible.

The results agree qualitatively with the investigations of H. Pottgiesser, Jun.[26], on the decarburization reaction during dephosphorizing.

Since in this case it is not the end of decarburization as in an industrial converter, but the beginning of dephosphorizing which defines the transition point, the carbon content at the transition, with an average of 0.11 per cent. is also higher than in an industrial converter, since the dephosphorizing begins before the end of the decarburization.

Oxygen and Manganese

To evaluate the influence of varying phosphorus percentages in the pig-iron on the range of scatter, when comparing the oxygen and phosphorus contents during the course of the blow, in Fig. 16, the relative phosphorus reductions are plotted, referred to the initial phosphorus content. The beginning of dephosphorization with a mean oxygen content of 0.34 per cent. can be clearly observed here. The peak value of the oxygen hump occurs in the last third of the dephosphorizing period, with phophorus percentages between 0.10 and 0.50 per cent. P, *i.e.*, it occurs precisely at a time instant at which, in the earlier works,[1-3] a previous reduction in the oxygen concentration has been observed.

The end of the actual dephosphorizing period coincides on the time scale with the end of the steep drop in the oxygen curve. At this instant of time the very rapid dissolution of the main bulk of the lime has terminated, the slag composition lies outside the miscibility gap and further dephosphorizing occurs, corresponding to the new determining increase in the iron content of the slag. In Fig. 17, the oxygen contents are shown as a function of the phosphorus content of the iron. Comparison with the equilibrium values given by W. A. Fischer and H. vom Ende[15] for iron melts under lime-saturated iron oxide slags containing phosphoric acid shows no relationship for high-phosphorus contents. Only with low-phosphorus content, towards the end of the blow, is the influence of the phosphate slag decisive and for these slags, the oxygen concentrations lie immediately above the equilibrium curve.

J. Massinon[27] investigating an industrial converter has found a very similar relationship between oxygen and phosphorus concentrations during dephosphorizing. With a number of melts, in each case one killed bomb sample was drawn at the beginning and also during the last third of the dephosphorizing period as well as at the end of the blow. The values given by Massinon agree well with the present results. Only the range of scatter given for higher phosphorus contents differs a little, but it is possible, for instance, that low-phosphorus concentrations during the transition are responsible. These working results which are reported without any interpretation provide a good confirmation for the present work.

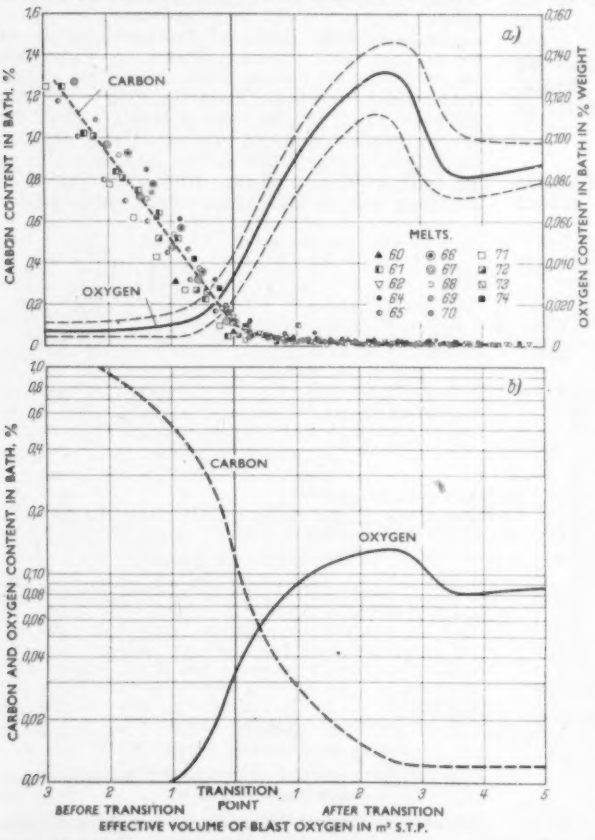

FIG. 15.—(*a*) CHANGES IN THE CARBON AND OXYGEN CONTENTS OF THE METAL BATH AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLOWN OXYGEN. (*b*) MEAN VALUES.

Oxygen and Sulphur

Fig. 18 shows a comparison of the change in the sulphur concentration of the iron during the blow with the curve of the oxygen concentration. It is seen from this picture that the sulphur concentration remains practically unchanged from the transition onwards. Independently of the very different initial sulphur concentrations in the pig-iron, between 0.032 and 0.086 per cent. S, the actual desulphurizing does not begin until, with advancing time, the peak value of the

oxygen hump is attained. The dependence of the degree of desulphurization on the time-course of the blow, shown in Fig. 19, emphasizes this time point at which desulphurizing begins, even more clearly. During the fall in the oxygen concentration, the degree of desulphurizing increases rapidly, up to about 50 to 60 per cent., and then shows practically no further change even with continued overblowing. The explanation for this reduction in the oxygen and sulphur contents of the iron, which begins simultaneously, is to be found in the fact that the intensification of the dissolution of the lime, which begins precisely at this instant, shifts the slag composition from the miscibility gap in the direction of the lime corner. The CaO component in the slag and the basicity of the slag are greatly increased and thus the essential conditions for increased desulphurization are produced. The reduction in the oxygen content of the metal, associated with the displacement of the slag composition from the miscibility gap contributes further to intensify the desulphurizing.

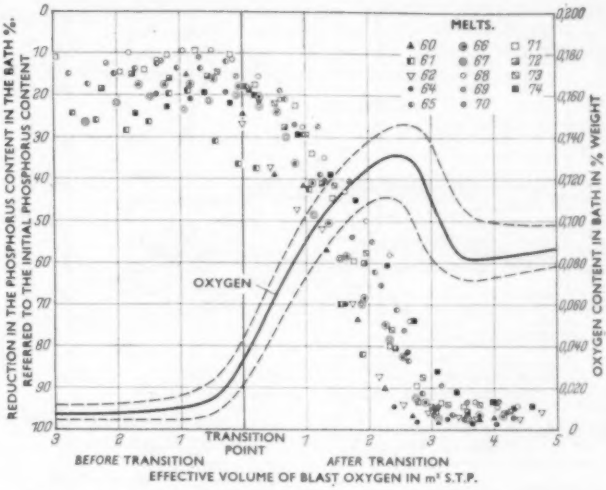
MELTS.
REDUCTION IN THE PHOSPHORUS CONTENT IN THE BATH %, REFERRED TO THE INITIAL PHOSPHORUS CONTENT
OXYGEN CONTENT IN BATH IN % WEIGHT
OXYGEN
TRANSITION POINT
BEFORE TRANSITION
AFTER TRANSITION
EFFECTIVE VOLUME OF BLAST OXYGEN IN m³ S.T.P.

FIG. 16.—BATH OXYGEN CONTENTS AND RELATIVE PHOSPHORUS ELIMINATION AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

In the later stages of the blow, the lime content of the slag is not increased further, the slag composition varies a little along the boundary of the miscibility gap in the direction of the iron corner and the oxygen content increases only slowly. Similarly, the sulphur content of the bath remains practically unchanged.

Oxygen and Nitrogen

Fig. 20 shows the mean values of the nitrogen rise and the bath oxygen concentration as a function of the effective volume of blast oxygen from the transition onwards. Although the change in the nitrogen concentration is only small, a characteristic curve can be established. Until shortly after the transition, a slight reduction in the nitrogen content is observed, which is to be explained by the scouring action of the carbon monoxide as a result of the very high rate of carbon elimination.[28–30] In spite of the action of the rising temperature, smaller carbon content and high partial pressure of the nitrogen, tending to increase the nitrogen content, the latter does not increase immediately after the transition point has been reached. The actual increase in the nitrogen content does not begin until, when the oxygen hump has been passed, the oxygen concentration again decreases. The effect of the high oxygen concentration in the iron[31–34] between the transition point and the instant of the oxygen peak value serves to delay the increase in the nitrogen and thus outweighs all other effects and apparently the increase in the nitrogen concentration only occurs when, due to reduction in the oxygen concentration, the rate of the nitrogen increase is accelerated.

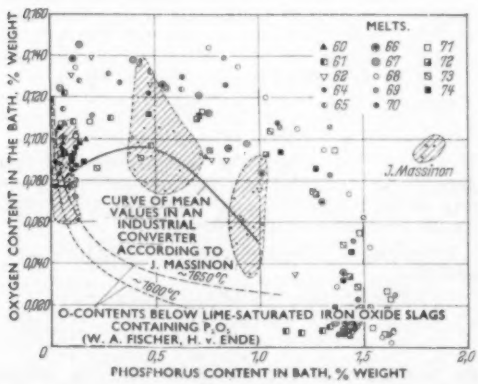
MELTS.
OXYGEN CONTENT IN THE BATH, % WEIGHT
J. Massinon
CURVE OF MEAN VALUES IN AN INDUSTRIAL CONVERTER ACCORDING TO J. MASSINON
~1650°C
~1600°C
O-CONTENTS BELOW LIME-SATURATED IRON OXIDE SLAGS CONTAINING P₂O₅ (W. A. FISCHER, H. v. ENDE)
PHOSPHORUS CONTENT IN BATH, % WEIGHT

FIG. 17.—PHOSPHORUS AND OXYGEN CONTENTS OF THE METAL BATH IN THE BLOWING EXPERIMENTAL CONVERTER.

The results reported by H. Kosmider and H. Schenck[35] for small and large converter melts point in the same direction as the present investigations. They found that an increase in the nitrogen content only occurs during a "reducing" blow, *i.e.*, if the amount of blast oxygen supplied is less than that consumed in the oxidation of the elements accompanying the iron. On the other hand, with a supply of blast oxygen exceeding the requirements for their elimination, no increase in the nitrogen concentration took place.

Calculating the Change in the Composition of the Slag During the Course of a Blow

For this calculation, the law of distribution and also the K_{Mn} values[23] found for pure FeO-MnO

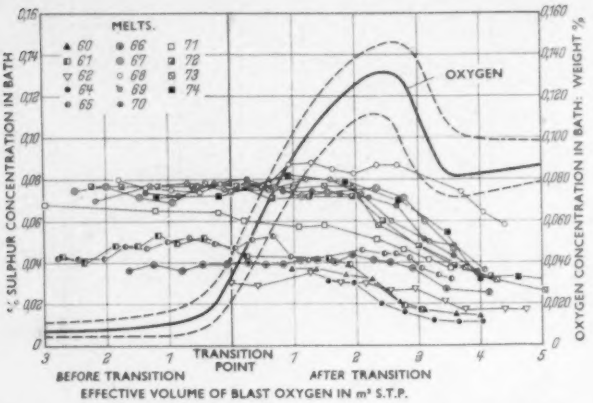

FIG. 18.—SULPHUR AND OXYGEN CONTENTS OF THE METAL BATH AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN

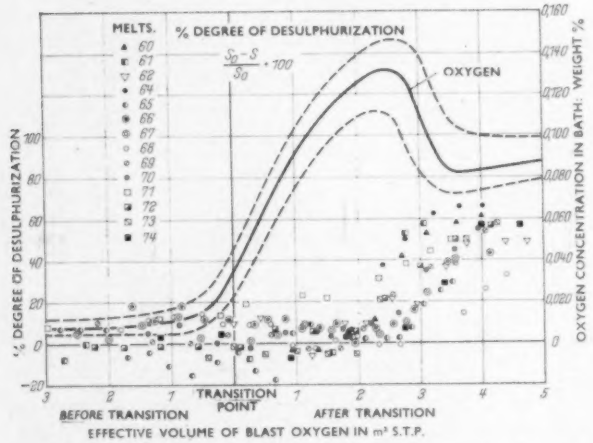

FIG. 19.—DEGREE OF DESULPHURIZATION AND OXYGEN CONCENTRATION IN THE METAL BATH AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

slags were assumed to be valid equally for the two layers of the separate slags. The calculation is based on the mean values of the temperature and the manganese contents of melts 60 and 69 to 74. From:

$$K_{Mn} = \frac{(\%MnO)}{(\%FeO)\ [\%Mn]} \quad \ldots (1)$$

it follows that:

$$\frac{(\%MnO)}{(\%FeO} = K_{Mn}\ [\%Mn]$$

and on account of the small difference in the molecular weights of FeO and MnO:

$$\frac{(\%MnO)}{(\%FeO)} = \frac{(MnO)}{(FeO)} \quad \ldots (2)$$

From Eq. (1) and (2), it follows that:

$$(MnO) = K_{Mn}\ [\%Mn]\ (FeO)$$

With:

$$(FeO) = L.\ [\%O].$$

the molar fraction (FeO + MnO) of the low-phosphorus ferric oxide layer of the separated slag can be calculated from the bath oxygen concentrations [%O] determined:

$$(FeO + MnO) = L.\ [\%]$$
$$(1 + K_{Mn})\ [\%Mn] \quad \ldots\ldots\ (3)$$

For the further calculation, the concentrations in weight per cent. are necessary. For this purpose, the boundary of the miscibility gap in molar fraction concentrations given by W. Oelsen and collaborators[6, 36] for 5 per cent. SiO_2 is converted and introduced into the ternary system (FeO + MnO)—(CaO)—(P_2O_5) on a molar fraction scale. By the lower boundary of the miscibility gap, the molar components (CaO) and (P_2O_5) in the (FeO + MnO) components calculated according to (3) can now be determined for the oxide layers. From these molar fraction concentrations, the slag compositions in percentage weight are then calculated.

The position of the thus calculated weight concentrations of the (FeO + MnO) component in the low-phosphorus oxide layer at the miscibility gap introduced into the ternary system (%FeO + %MnO)—(%CaO)—(P_2O_5) now give the composition of the oxide layer and, with the appropriate co-nodes, also of the low-oxide phosphate layer (Fig. 13). The total compositions of the slag must lie on the corresponding co-nodes. They have been calculated from the elimination curves for phosphorus and manganese as follows.

If [%Po] [%Mn_O] are the phosphorus and manganese percentages in the pig iron and [%P] [%Mn] the bath concentrations at the instant in question, then, with a charge weight of 250 kg., the weight of the total phosphoric acid formed up to that time in kg, is:

$$G_{P_2O_5} = \frac{[\%Po] - [\%P]}{100} \cdot \frac{250 \cdot 142}{62} \quad \ldots\ (4)$$

If G_{Ox} and G_{Ph} are the weights of the low-phosphorus oxide slag and the low-oxide phosphate slag in kg. $(\%P_2O_5)_{Ox}$ and $(\%P_2O_5)_{Ph}$ their phosphoric acid contents, then we have:

$$100 \cdot G_{P_2O_5} = (\%P_2O_5)_{Ox} \cdot G_{Ox} + (\%P_2O_5)_{Ph} \cdot G_{Ph}$$

and since

$$(\%P_2O_5)_{Ox} \cdot G_{Ox} - (\%P_2O_5)_{Ph} \cdot G_{Ph}:—$$

$$G_{Ph} = \frac{100 \cdot G_{P_2O_5}}{(\%P_2O_5)_{Ph}} \quad \ldots\ (5)$$

By analogy with (4), we obtain for the weight of the manganese (II)-oxide formed:

$$G_{MnO} = \frac{[\%Mn] - [\%Mn]}{100} \cdot \frac{250 \cdot 71}{55} \quad \ldots\ (6)$$

and :

$$100 \cdot G_{MnO} = (\%MnO)_{O_X} \cdot G_{O_X} + (\%MnO)_{Ph} \cdot G_{Ph} \quad .. \quad (7)$$

From the (FeO + MnO) concentrations of the two slag layers, which are given by the boundaries of the miscibility gap, since:

$$(\%MnO)_{O_X} = \frac{(\%MnO + \%FeO)_{O_X}}{1 + K_{Mn} \cdot [\%Mn]} \quad .. \quad (8a)$$

and the MnO component of the phosphate layer:—

$$(\%MnO)_{Ph} = \frac{(\%MnO + \%FeO)_{Ph}}{1 + K_{Mn} \cdot [\%Mn]} \quad .. \quad (8b)$$

From (7) we obtain the weight of the oxide layer in kg. as

$$G_{O_X} = \frac{100 \cdot G_{MnO} - (\%MnO_{Ph}) \cdot G_{Ph}}{(\%MnO)_{O_X}} \quad .. \quad (9)$$

and, finally, the P_2O_5 concentration in the total slag is:

$$(\%P_2O_5)_{Ges} = \frac{100 \cdot G_{P_2O_5}}{G_{O_X} + G_{Ph}} \quad .... \quad (10)$$

The position of the P_2O_5– content calculated from (10) on the appropriate co-nodes gives the total slag composition for the instant considered.

The authors' thanks are due to the Hagen-Halden Works of the Dolomitwerke GmbH for the free use of the converter. Thanks are also due to the August Thyssen-Hütte A.G., Duisburg-Hamborn, for performing the oxygen analyses free of charge and to Dr. K. Abresch for their careful execution.

Summary

A new method of sampling has been developed to ascertain the change in the oxygen content in a basic-Bessemer converter during the blow, by which perfect specimens for oxygen determination were drawn from an experimental converter without interrupting the blow, at intervals of 20 sec. It was found that at the transition point there is already a well-determined oxygen concentration in the metal amounting on an average to 0.34 per cent. and from this it is concluded that a minimum oxygen content of this value must be present in the metal in order that dephosphorizing can begin. The change in time of the bath oxygen concentration after the transition point has the form of a well-defined hump, the maximum value of which amounts to as much as 0.14 per cent. O and is attained at the start of the last third of the dephosphorizing phase.

Comparison with the oxygen saturation concentrations under FeO-MnO and lime-saturated iron-phosphate slags provides a direct proof for the existence of a miscibility gap in (FeO + MnO)—(CaO)—(P_2O_5) slags. The change in the slag composition within the miscibility gap produced during the course of the blow has been calculated, using simplifying assumptions. The result agrees well with the experimental data. Finally, it has been proved that after the transition there is a direct relationship between the curve of the oxygen concentration and the decarburization, desulphurization, and reduction in nitrogen.

REFERENCES

[1] Mitt. K.-Wilh.-Inst. Eisenforsch. 14 (1932), pp. 205-219; Stahl u. Eisen 52 (1932), p. 1176.
[2] Mitt. K.-Wilh.-Inst. Eisenforsch. 15 (1933), pp. 311-314; Stahl u. Eisen 54 (1934), pp. 112-113.
[3] Stanl u. Eisen 61 (1941), pp. 1053-1064 (Stahlwerksaussch. 391). Also Dr.-Ing.-Diss., Techn. Hochsch. Aachen, Th. Kootz; Ebenda 62 (1942), pp. 141-143.
[4] Stahl u. Eisen 61 (1941), pp. 337-349 (Stahlwerksaussch. 382). Also Dr.-Ing.-Diss. von A. Wilms, Techn. Hochsch. Aachen.
[5] Stahl u. Eisen 62 (1942), pp. 749-756 (Stahlwerksaussch. 400).
[6] Mitt. K.-Wilh.-Inst. Eisenforsch. 23 (1941), pp. 195-245; Stahl u. Eisen 62 (1942), pp. 123-124.
[7] W. Eichholz, and Th. Kootz: Fortschritte im Windfrischverfahren. In: Aus der Facharbeit auf dem Gebiet des Eisenhüttenwesens in den Jahren 1939-45, Düsseldorf, 1953, pp. 164-175.
[8] W. Eichholz, W. Behrendt, and Th. Kootz, Stahl u. Eisen 60 (1940), pp. 61-72.
[9] Stahl u. Eisen 59 (1939), pp. 1057-1067 (Stahlwerksaussch. 358). Dr.-Ing.-Diss. (Auszug) von W. Roeser, Techn. Hochsch. Aachen.
[10] Tagung der Sektion Lüttich des "Congrès National de Recherche Métallurgiques (C.N.R.M.)" June, 1949; Stahl. u. Eisen 70 (1950), pp. 1015-1017.
[11] Stahl u. Eisen 78 (1958), pp. 646-654 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 764, and Stahlwerksaussch. 644).
[12] W. Oelsen, Stahl u. Eisen 73 (1953), pp. 495-498 (Chemikeraussch. 203).
[13] H. Schenck, W. Riess, and E. O. Bruggemann, Z. Elektrochem. 38 (1932)., pp. 562-568.
[14] Arch. Eisenhüttenwes. 23 (1952), pp. 21-33 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 547, u. Chemikeraussch. 195). Also Dr.-Ing.-Diss. von H. vom Ende, Techn. Hochsch. Aachen.
[15] Stahl u. Eisen 72 (1952), pp. 1398-1408 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 567, u. Stahlwerksaussch. 511).
[16] Stahl u. Eisen 69 (1949), pp. 405-468 and 487-490.
[17] Arch. Eisenhüttenwes. 30 (1959), pp. 1-6.
[18] Arch. Eisenhüttenwes. 26 (1955), pp. 127-130 (Chemikeraussch 234).
[19] Arch. Eisenhüttenwes. 30 (1959), pp. 199-204 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 806).
[20] Arch. Eisenhüttenwes. 31 (1960), pp. 411-417 (Mitt. Max- Planck-Inst. Eisenforsch., Paper 854).
[21] J. Chipman and K. L. Fetters, Trans. Amer. Soc. Metals 29 (1941) pp. 953-968.
[22] Taylor, C. R., u. J. Chipman : Trans. Amer. Inst. min. metallurg. Eng. 154 (1943) P. 228/47.
[23] Arch. Eisenhüttenwes. 32 (1961), pp. 1-11 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 870).
[24] Arch. Eisenhüttenwes. 30 (1959), pp. 461-472 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 822).
[25] Trans. Amer. Soc. Metals 30 (1942), pp. 695-746.
[26] Stahl u. Eisen 78 (1958), pp. 291-298 (Stahlwerksaussch. 642). Also Dr.-Ing.-Diss. (Auszug), Bergakad. Clausthal-Zellerfeld.

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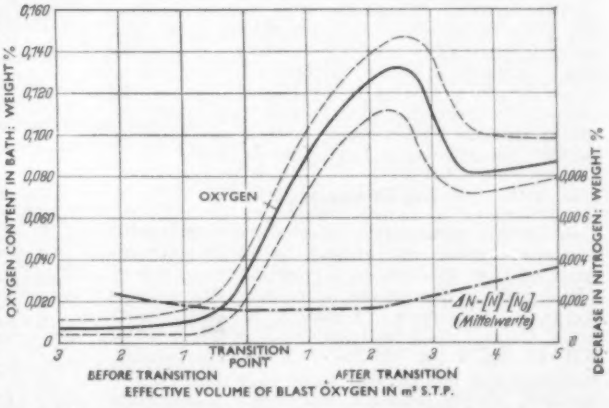

FIG. 20.—DECREASE IN NITROGEN AND OXYGEN CONCENTRATIONS IN METAL BATH AS A FUNCTION OF THE EFFECTIVE VOLUME OF BLAST OXYGEN.

CLEANING OF O-H FURNACE WASTE GASES

This article is a translation of a letter in Metallurg, 1960, V, No. 9, p. 21. The writer, Yu. V. Krasovitskii, who is with NIIOGAZ, briefly reviews the question of cleaning open-hearth furnace waste gases and then outlines a cleaning method developed in the USSR which employs a layer-type filter of granular material.

ONE of the basic factors in speeding up the working of O-H furnaces is the use of oxygen. The resultant increase in thermal loading, and rise in the temperature of the combustion gases in the melting zone, cause a sharp increase in the production of dust, obtaining in a 200-ton furnace, for instance, as much as 7,000 to 7,400 kg. per 24 hr. and more than 20 per cent. of this dust by weight passes out into the waste-gas flue.

Open-hearth furnace dust is marked by its very high degree of dispersion. As our investigations have shown, the dimension of the dust particles at the entrance into the waste-heat boilers does not exceed 1 to 2μ. In consequence, a dark brown curtain of dust is formed above a works and its surroundings; the content of dust suspended in the air amounts to as much as 220 kg./Nm^3. At the furnace itself there is also a sharp increase in the quantity of dust deposited on the heat-exchange surfaces of the checkers and waste-heat boilers.

The dust adheres to the tubes of the waste-heat boilers, reducing the steam output capacity. At the same time there is a rise in aerodynamic resistance to passage through the furnace flues, and an increase in the temperature of the waste gases emerging from the boiler, which reduces the ability of the forced draught fan to extract the gases, and in the last resort lowers the operational efficiency of the furnace. Therefore, dust extraction from the gases before they reach waste-heat boilers has great importance. Existing methods of cleaning (*e.g.*, electrostatic filters, scrubbers, froth-flotation systems) are not suitable for application to the cleaning of waste-flue gases before they enter into the waste-heat boilers, both in view of the basic design, and also on technological grounds.

Use of Slag Wool

A certain importance attaches to experiments recently carried out abroad in cleaning waste gases of O-H furnaces at a temperature of 600 to 650 deg. C. by passing them through a filter of slag wool (L. Silverman, "Cleaning of Open-hearth Stack Gases," Blast Furnace and Steel Plant, 1955, VII, 43, No. 7, pp. 735-744, 752). In our opinion, however, the use of slag wool as a filter is unjustified, simply because the upper temperature limit of the application of such filters is restricted to between 650 and 670 deg. C., quite apart from the high cost of slag wool, its heavy consumption, and its high aerodynamic resistance (up to 500 kg./m^2.), and the complexity of regeneration.

NIIOGAZ has developed a highly effective method of cleaning waste gases, drawn off from the flues of open-hearth furnaces before their entry to the waste-heat boilers, through a layer-type filter charged with granular material. As the filtering material it is most advantageous to use quartz sand, having a particle diameter of 1 to 3 mm., with the addition of 14 to 16 per cent. by weight of pulverized magnesite brick of the same particle size range, which is intended to lower the thermal resistance of the layer of filtering material.

The optimum parameters of the filter (layer thickness 40 to 45 mm., rate of filtration, relative to the whole cross-section of the layer, 0.5 m./sec.) ensure a degree of cleaning of the flue gases of 92 to 93 per cent., where the average aerodynamic resistance of the filter is 85 to 100kg./m^2., and the dimension of the particles of open-hearth dust is not greater than 2μ. Where the dimension of the dust particles in the stream of gas is greater, the degree of cleaning will rise. Under industrial conditions a vertical position of the filtering material is the most convenient. Under such conditions it is advantageous to build the filter in the form of a series of sections working in parallel, which makes it possible to set up a sufficiently compact installation.

From the experiments carried out to select the optimum method of regeneration of the filtering material, it follows that the most reliable method of removing the dust trapped by the filter is intensive washing of the filtering material with water, followed by drying and replacement in the apparatus.

At the present time NIIOGAZ, in co-operation with the "Hammer and Sickle" Works and the Giprogazoochistka Institute, is working out the finished design of the layer-type filter and of the ancillary equipment for cleaning the gases emerging from open-hearth furnaces before their entry into the waste-heat boilers. This method of cleaning may also prove suitable for many other branches of industry.

Oxygen Content of Basic Converter Steel

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[27] Rev. univ. Mines, 9, Sér., 93 (1950), pp. 255-263.
[28] F. A. Springorum, K. G. Speith, O. Darmann, and H. vom Ende, Stahl u. Eisen 77 (1957), pp. 1284-1296.
[29] W. Oelsen, and H. J. Darmann, Stahl u. Eisen 73 (1953), pp. 338-346 (Stahlwerksaussch. 521).
[30] K. G. Speith and H. Bücken, Stahl u. Eisen 74 (1954), pp. 1648-1650 (Stahlwerksaussch. 566).
[31] W. A. Fischer and A. Hoffmann, Arch. Eisenhüttenwes. 29 (1958), pp. 339-349 (Mitt. Max-Planck-Inst. Eisenforsch., Paper 768, u. Werkstoffaussch. 1130).
[32] Th. Kootz, Stahl u. Eisen 79 (1959), pp. 135-137 and 140-141 (Stahlwerksaussch. 662).
[33] G. Naeser and W. Scholz, Stahl u. Eisen 79 (1959), pp. 137-141 (Stahlwerksaussch. 663).
[34] H. Schenck, M. Frohberg, and H. Graf, Arch. Eisenhüttenwes. 30 (1959), pp. 533-537.
[35] Stahl u. Eisen 74 (1954), pp. 1281-1292 (Stahlwerksaussch. 559).
[36] W. Oelsen and H. Maetz, Arch. Eisenhüttenwes. 19 (1948), pp. 111-117 (Mitt. K.-Wilh.-Inst. Eisenforsch., Paper 468).

Firedamp Drainage in Mines

Part 1.—Application in Yorkshire

*by I. H. MORRIS, Ph.D., M.Sc.**

Factors leading to concentrations of firedamp in mines and the application of firedamp drainage in Yorkshire are discussed in this paper, presented to the Yorkshire Branch of the National Association of Colliery Managers on January 10, 1960. The flow and quality characteristics of the drained gas, under free-flow and induced conditions, are also outlined. The second part of the paper, to be published next week, will be devoted to the practical benefits which can be obtained from methane drainage.

FORCES necessary to release adsorbed firedamp from coal and coal measures are set up during the working of coal seams. Extraction of coal causes intensification of stresses around the moving longwall coal face resulting in fracture of strata above and below the extracted seam. Practical observations on the physical condition of gate roadways behind advancing coal faces almost invariably show a position some distance behind the coal face where inrceased pressure has led to increased roadway deformation and crush (as might befit the rear pressure position suggested by the pressure arch theory). A similar, but apparently more pronounced, position of increased pressure is also considered to exist ahead of a coal face. It is a matter of practical observation that the distance of the back pressure position from the ripping lip of an advancing coal face appears to increase with depth. Besides this longitudinal pressure arch, it is postulated that a transverse pressure arch exists across the area from which coal is being extracted.

Within the area of the longitudinal and transverse pressure arches, strata is known to be relaxed and fractured and relative movement is caused by strata forces of different magnitudes. Fracture of strata causes continual exposure of fresh surfaces of coal-measure strata and coal seams with face advance, and innumerable escape routes are provided for the adsorbed firedamp which escapes at ripping lips, on the coal face, from wastes, in fast ends, in the return or intake gates, at fault planes, rolls, washouts, and sometimes from the floor of the seam being worked. With the advance of the coal face and relaxed zone, however, strata at the outbye extremity of the pressure arch again becomes stressed. In consequence, closure of strata breaks and fractures occur with a reduction in, or cessation of, gas flows and isolation of some gas sources from the airways of the mine.

It is significant that the actual methane yield per ton may be substantially higher than the methane yield per ton obtained experimentally from samples of coal from the extracted coal seams. The difference may be explained in part by the fact that a high proportion of the firedamp released in a ventilating district emanates from coal-measure strata surrounding the coal seam being exploited.

Generally, a number of gas horizons exist above and below the extracted coal seam as can be readily demonstrated during the drilling of boreholes for firedamp drainage. In the majority of instances (apart from cases where coal exists in the immediate roof or floor of a roadway and where no faults are present), small gas flow rates are met within the standpipe length, say, to vertical distances of about 20 ft. Beyond these distances, however, productive gas horizons are often encountered—up to vertical heights of about 150 ft., and down to vertical depths of about 75 ft., depending on local conditions. In the Barnsley Seam, for example, productive gas sources are found often at vertical heights of about 50 ft., though in a number of installations, additional productive sources continue to be found at vertical heights up to 150 ft.

Frequently, prominent gas sources are found in sandstone, sandy bind or shale formations above thin coal seams, which may be from 6 to 18 in. thick. In other instances, evidence suggests that a close-grained sandstone or rock forms an upper blanket or ceiling which, if it does not fracture,

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limits migration of methane to higher horizons. In exceptional cases, highly productive gas sources have been found within a vertical distance of 40 ft. of the seam which is being worked.

Firedamp Distributions

Investigations undertaken over a number of years indicate that this explanation of the source and release of firedamp provides a useful, but over-simplified, exposition of conditions which exist in the proximity of productive coal faces. Some of the ventilation data relative to moderately gassy ventilating districts in level or almost level seams, without firedamp drainage is summarized below. Exceptional cases are not considered.

(1) In the return gate, particularly a barrier side gate, a consistent methane build-up occurs within the relaxed zone between a coal face and the crushed portion of the airway some distance outbye the advancing coal face. A smaller methane build-up may occur from the crushed portion of the airway to the outbye end of the return gate.

(2) In a number of cases, firedamp enters the roadways of a productive panel through innumerable comparatively small sources at the coal face, in wastes, at ripping lips, in the roof, and/or floor, and sides of gate roadways—usually return gates.

(3) Individual firedamp sources in gates, in general, are small, as can often be shown by the fact that methane concentrations in fissures and other paths are reduced quickly by a methanometer sampling at the rate of about 0.035 cu. ft./min. With the cessation of sampling, methane concentrations increase again with time. Substantial sources of methane, however, can be located in intake gates, ripping lips, and return gates, and a number of notable cases is known.

(4) Most firedamp sources advance with productive coal faces, though important exceptions have been encountered. With the advance of longwall coal faces and the relaxed zone, for example, boreholes drilled for firedamp drainage purposes, and which once yielded significant amounts of methane, say, up to 150 cu. ft./min., cease to be productive when at distances greater than about 70 to 150 yd. from the coal face, depending upon depth. Exceptions can be found with sources at pillar edges, at positions in gate roadways where changes in method of strata control have occurred, and with first boreholes in gate roadways.

(5) Methane gradients in roadway sides and roof, that is, the build up of methane with depth in strata forming the sides and roof of airways, may vary from about 0.5 per cent. per in. depth to about 25 per cent. per in. depth in the more gassy seams. Such figures may increase with a fall in atmospheric pressure.

In many cases, methane gradients increase rapidly with depth into strata from the entrance of a borehole or fissure. Gradients fall off almost to zero with a further small increase in depth from the side of the roadway, however, and methane concentrations frequently are of the order of 100 per cent.

(6) In general, productive firedamp sources are not found within the height associated with the immediate roof, though gas with high methane concentrations is evidently present. However, a number of exceptions could be cited.

The immediate roof, which for present purposes is considered as the roof immediately adjacent to the extracted coal seam in which comparatively large bed separation planes are present, appears to have a height of two or three seam thicknesses, as indicated in practice by the irregular advance of the firedamp drainage drilling machine.

(7) Methane distributions in intake gates with unit ventilation appear to be independent of the pressure arch even though the intensive back pressure position may be evident. Exceptions have been found in barrier side intake gates of coal faces, particularly when a descensional ventilation system is employed, and in intake gates of long development or initial flank panels in gassy coal seams.

(8) Methane distributions at moderately gassy coal faces sometimes appear to be related to the assumed position of a transverse pressure arch such that in the same seam and with similar differential ventilating pressures across coal faces:—

(i) Methane build-up in the ventilating stream on the coal face itself is frequently small on short coal faces when coal face length is less than the apparent span.

(ii) A significant methane build-up occurs in the ventilating stream at the return end of longer coal faces, with length exceeding the expected pressure arch span.

(9) In most cases, methane concentrations at waste edges along a coal face at first increase slowly from the intake to the return gate. The increase in methane concentrations at waste edges on the return side of the coal face, however, is marked as shown in curve A, Fig. 1.

On coal faces with rib side intake gates, however, methane concentrations at waste edges on the intake side of the coal face may be higher, but the increase in methane concentrations at waste edges on the return side of the coal face is smaller, as illustrated in curve B, Fig. 1. Methane concentra-

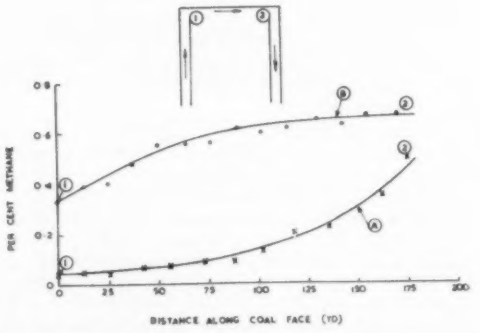


FIG. 1.—INCREASE IN METHANE CONCENTRATIONS AT THE WASTE EDGES. POINT 1 RELATES TO THE INTAKE END OF THE FACE AND POINT 2 TO THE RETURN END.

tions at waste edges of coal faces advancing to the rise are higher than those found in faces advancing to the dip or the strike in the same seam.

(10) Methane concentrations at waste edges of strip packed coal faces often show little variation either from floor to roof or from side to side in a particular waste on the intake side of the coal face with ascensional ventilation. However, methane concentrations at waste edges of the two or three wastes adjacent to the return gate increase from floor to roof height. Methane concentrations may be maximum at roof height in the last (return side) waste. At the edges of the last waste, methane concentrations increase at a given height from the intake to return side of that waste.

(11) Within accessible distances in individual wastes (9 to 15 ft.) and at a given height, methane concentrations increase with distance from the waste edge on coal faces advancing on strike or to the dip. The increase in methane concentrations with depth into the waste is not so prominent on coal faces advancing to the rise.

The increase in methane concentrations with depth is small in wastes on the intake side of a coal face, but often is marked in wastes, particularly the last two or three, on the return side of a coal face.

(12) Some coal faces, giving methane yields of the order of about 200 cu. ft./min., show small methane concentrations on the coal face itself, in fast corners and in wastes to depths of about 15 ft. The total methane flow rate at the return end of the coal face may only be 40 cu. ft./min. However, substantial methane inflow rates occur at the return ripping lip, and between the return ripping lip and the outbye rear pressure position. Investigations carried out in the vicinity of return ripping lips have shown high methane concentrations in fissures and roof cavities, as well as high methane gradients.

(13) Even with mean or local air speeds in excess of 150 ft./min., gas layering may exist in gate roadways. In such cases increased air quantities and increased local air velocities may reduce the thickness of gas layers, but may be unable to remove them. In these circumstances, investigations show that comparatively large methane gradients are present in the airways and in strata surrounding the gate roadways.

Typical results obtained from investigations on general body methane concentrations of productive coal faces and districts without firedamp drainage are shown in Fig. 2. These observations were taken on coal faces where the methane yield rate ranged from about 30 to 450 cu. ft./min. In illustrations A, B, D, E, F, G, and H, the comparatively high

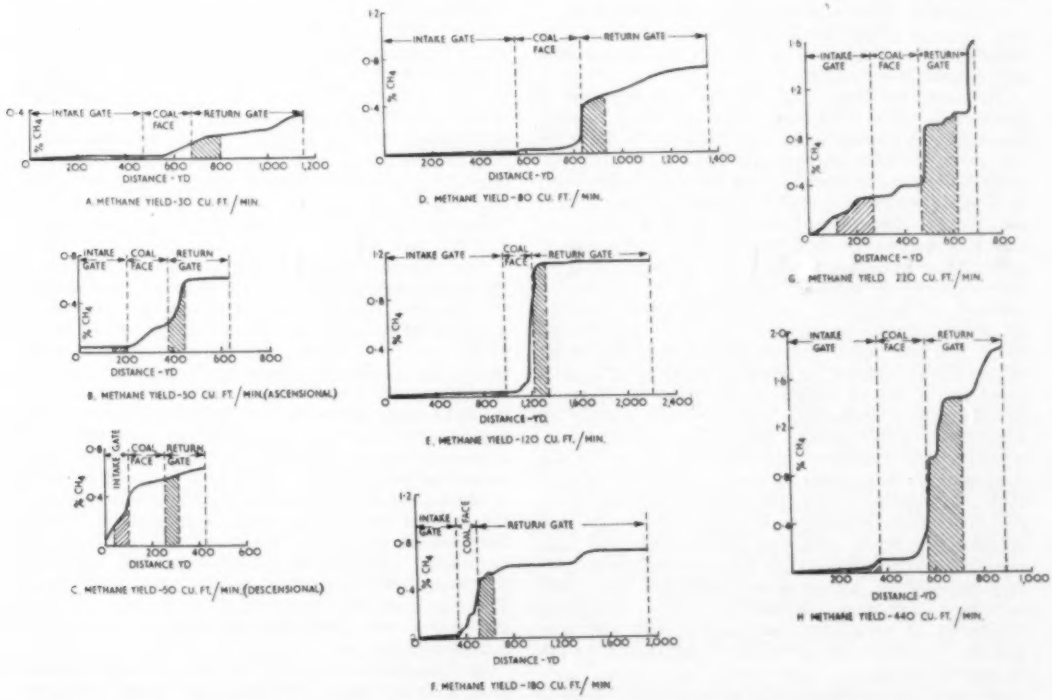

INTAKE GATE
COAL FACE
RETURN GATE
% CH4
DISTANCE - YD
A. METHANE YIELD - 30 CU. FT./MIN.
D. METHANE YIELD - 80 CU. FT./MIN.
G. METHANE YIELD 220 CU. FT./MIN.
B. METHANE YIELD - 50 CU. FT./MIN.(ASCENSIONAL)
E. METHANE YIELD - 120 CU. FT./MIN.
C. METHANE YIELD - 50 CU. FT./MIN.(DESCENSIONAL)
H. METHANE YIELD - 440 CU. FT./MIN.
F. METHANE YIELD - 180 CU. FT./MIN.

FIG. 2.—TYPICAL RESULTS OBTAINED FROM INVESTIGATIONS ON GENERAL BODY METHANE CONCENTRATIONS OF PRODUCTIVE FACES AND DISTRICTS WITHOUT FIREDAMP DRAINAGE. THE SHADED AREAS REPRESENT SAMPLES TAKEN AT THE MAIN AND RETURN RIPPING LIPS.

methane inflow rates at the return end of the coal faces, at the return ripping lips and at the inbye end of the return gates are evident. In case C, a single-unit coal face was being ventilated descensionally with a rib side gate as the intake airway to the panel. A notable methane inflow rate existed in the rib side intake gate in a level seam in case G also.

Intake and return ripping lips, fast corners and wastes presented few problems in cases A, B, D, E, F, and H. In cases C and G, on the other hand, intake ripping lips and fast ends were frequently troublesome, while many of the waste edges at the intake and return end of those coal faces presented problems on various occasions.

Principal Aims of Firedamp Drainage

One of the objects in methane drainage is to make contact with firedamp sources within the relaxed zone, *i.e.*, behind an advancing coal face, by drilling. Once contacted, firedamp sources are subjected to suction. Thereby, firedamp is drawn into a steel pipe system, is passed through an extractor pump, and then discharged safely either into return air below ground, to atmosphere at the surface of the mine, or into a delivery pipe for gas utilization.

By such means, a high proportion, usually about 50 to 65 per cent., of the total methane made in a working district can be removed before it enters the workings of the mine.

Removing firedamp near its sources, therefore, can make a direct contribution to ventilation efficiency of coal faces and districts in moderately gassy and gassy mines.

Firedamp drainage may be employed for one or more of the following reasons:—To reduce methane concentrations in a return gate; to decrease the flow of methane on the coal face itself; to reduce methane concentrations at waste edges and in wastes; to limit methane emission rates at ripping lips; to control the inflow of methane in intake gates; to remove, or limit, the amount of layering of methane in gate roadways; in some cases, to limit the amount of methane found in fast ends; to control and reduce the amount of firedamp released at fault planes on gates and on coal faces; to control and reduce the amount of firedamp being released from feeders or blowers in gates or at coal faces or in wastes behind coal faces; to improve environmental conditions at coal faces which, on account of high methane yield rates, would otherwise require excessive air flow rates; to reduce methane concentrations in main return airways; to limit contamination of intake air by methane emitting from old districts; to increase production and productivity while retaining satisfactory and safe ventilating arrangements; to reduce ventilation costs and expenditure on ventilation schemes while still providing adequate, satisfactory, and improved standards of ventilation and airways of adequate size in the mine; and possibly to provide a source of gaseous fuel.

At least three methods of firedamp drainage may be applied using:—Short boreholes; long boreholes; and stoppings.

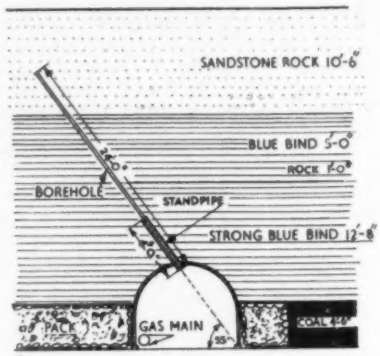


FIG. 3.—SHORT BOREHOLE METHOD OF FIREDAMP DRAINAGE.

Short Borehole (Manvers) Method

In this application, holes were drilled regularly behind an advancing coal face at a distance of about 10 yd. from the return ripping lip. The method was noteworthy in that short standpipes were used and the boreholes themselves were short. Standpipes with rubber or canvas seals were employed.

In essence, short boreholes with overall lengths varying from 24 to 40 ft. were drilled over the waste as shown in Fig. 3. Boreholes were inclined at angles of 50 to 55 deg. to the horizontal, and were drilled at a diameter of 3¼ in. throughout their length. Subsequently, a steel standpipe was inserted near the mouth of the borehole. The standpipe consisted of inner and outer members and resembled a water-infusion gun. The outer pipe had a diameter of 3 in. It was fitted at one end with a fixed welded-on collar, while the other (inner) end was left open.

The inner tube which had a diameter of 2½ in. was threaded externally for part of its length at one end. At the other end, the pipe was opened out to form a bell mouth with a maximum outside diameter of about 3 in. The inner tube was inserted within the outer, and a rubber or a canvas "sock" was placed over the smaller end of the bell of the inner tube. By tightening up the nut of the inner threaded tube against the collar of the outer, the inner pipe was drawn within the outer tube, causing the rubber ring or sock to be shortened and forced against the inside of the borehole. Tightening up was continued until the rubber or canvas sock was wedged firmly between the inner tube wall and the inside of the borehole. Thereby, an effective seal was obtained between firedamp sources and the return gate itself. The standpipe was connected up to the gas main and the suction was applied to the borehole in the conventional manner.

In this application, each borehole was drilled into a rock bed which overlies about 18 ft. of bind. The latter rests directly on a coal seam, about 4 ft. 6 in. thick. This method of drainage was applied

successfully in a barrier side gate for a number of years and enabled methane concentrations at the ripping lip and outbye end of the return gate to be reduced to approximately half the original values. Methane concentrations at the outbye end of the return gate were maintained at about 0.9 per cent. and a methane yield of about 65 cu. ft./min. was achieved consistently.

An examination of the arrangements and results of the short borehole system yielded the following information:—(*a*) A simple mechanical seal was employed; (*b*) the system was exceptionally simple and effective; (*c*) only a small borehole suction, up to about 0.5 in. water gauge was necessary in most cases to achieve the desired results; (*d*) the methane yield rate from each borehole was comparatively small, being about 7.5 cu. ft./min. on average; (*e*) methane concentrations of about 60 per cent. were regularly obtained from boreholes; (*f*) very little, if any, gas pressure could be measured after boreholes were drilled; (*g*) about half the total methane flow rate in the ventilating district was collected into the pipe system before it could enter the ventilating circuits.

Evidence available suggests that, if used with discretion, the short borehole system can be useful in seams where methane yields are small, and where methane yields and distributions at ripping lips are significant. The method could be applied where methane sources are fairly close to the roof of the extracted seam, giving rise to persistent small methane feeders, accumulations of methane, and gas layering in gate roadways.

Long Borehole Approach

Thirteen of the 15 installations in the North-Eastern Divisional Coal Board employ long boreholes which are drilled over the waste just behind the coal face. Boreholes generally have inclined lengths varying from 70 to 300 ft., though in some cases productive firedamp sources have been obtained at inclined distances of only 45 ft. Holes are generally drilled upwards at angles of 35 to 50 deg. to the horizontal, are spaced at intervals of about 25 yd., and are provided with standpipes approximately 30 ft. long.

Firedamp may also be drained from boreholes drilled in the floor of a coal seam. Down boreholes may be drilled to an inclined length ranging from 60 to about 150 ft., are provided with 25 ft. long standpipes and are spaced at 25-yd. intervals also. Holes may be bored at angles ranging from 20 to 45 deg. to the horizontal and may be drilled parallel to the line of face or be given a forward lead of 30 to 60 deg. towards the coal face. The standpipe itself consists of 3-in. bore steel tube, about 30 ft. long made of five 6-ft. long sections.

Stopping Approach

Firedamp drainage applied in conjunction with pressure chambers is a comparatively recent development, and has been introduced to limit the pollution of mine air by gas emitting from old, sealed off, districts[8].

In moderately gassy and gassy seams, it is known that methane continues to be emitted in old districts despite the fact that coal production has ceased and the districts have been drawn and stopped off. Under steady barometric conditions, the rate of methane yield in an old ventilating district may be about one tenth to one third of that of a fully productive district, and may range from about 10 to 100 cu. ft./min. (methane) for some time after coal production has ceased. Exceptionally, larger methane yields have been experienced.

In old, sealed-off districts, significant space volume exists, particularly in seams with strong roof such as the Parkgate Seam in certain localities, into which firedamp may be emitted continuously. Changes in barometric pressure cause volume changes within the sealed area, the gas volume increasing with a fall in barometer and decreasing with rise in atmospheric pressure.

In the stopping approach, a gas and air, or an air seal (ideally a hermetic seal) is formed between the sealed area and the existing workings of the mine. By providing such a seal at an intake or a return stopping, or both, and extracting the relevant volume of gas from the old area, movement of gas out of, or the inleakage of air into, a stopped-off district with barometric changes can be limited and ideally prevented.

Development of Firedamp Drainage in the North-Eastern Division

The first significant application of firedamp drainage in the North-Eastern Divisional Coal Board appears to have been made in May, 1956, when a single borehole drilled in strata above the Barnsley Seam yielded about 35 cu. ft./min. of firedamp containing 86 per cent. methane.

By the beginning of 1957, there was one firedamp drainage installation in the division producing approximately 175 cu. ft./min., or 250,000 cu. ft./day, methane from one gate and five boreholes. During the latter part of 1957, however, the first notable extension in the application of firedamp drainage took place with the result that, by the end of that year, the number of installations in the division had increased to five. At the same time, the total flow rate of drained methane rose to 750 cu. ft./min. or 1,080,000 cu. ft./day. Firedamp drainage by vacuum pump was confined at that time to the Barnsley and Haighmoor seams. Drainage was applied to 34 boreholes in seven return gates.

Further extension in the application of firedamp drainage resulted in the number of installations being increased to nine by the end of 1958, from which the total methane rate of extraction was of the order of 1,450 cu. ft./min. or 2,100,000 cu. ft./day. Successful installations existed in the Barnsley, Haighmoor, and Thorncliffe seams. Firedamp was being drained from 16 return gates and 53 boreholes.

By September, 1959, the number of mines employing firedamp drainage was 15. Further, at a number of these collieries, two separate underground installations were employed. The total quantity of methane drained was about 2,750 cu.

TABLE 1.—*General Details of Firedamp Drainage Installations in the North-Eastern Division.*

Colliery.	Number of gates used.	Per cent. methane in gas.	Flow rates.				Number of boreholes.
			Gas.		Methane.		
			Surface.	Underground.	Surface.	Underground.	
			Cu. ft./min.	Cu. ft./min.	Cu. ft./min.	Cu. ft./min.	
A	5	72	665	—	480	—	25
B	3	70	—	360	—	250	16
C	1	70	—	115	—	80	2
D	1	67	—	100	—	65	3
E	3	67	—	195	—	130	9
F	3	67	780	—	520	—	12
G	3	75	—	320	—	240	5
H	1	80	—	130	—	105	2
I	1	80	—	190	—	150	6
J	1	70	—	160	—	110	3
K	2	70	—	360	—	250	4
L	1	65	—	90	—	60	10
M	2	70	160	—	110	—	10
N	2	75	—	225	—	170	4
O	1	60	35	—	20	—	2

ft./min., or almost 4,000,000 cu. ft./day from 30 return gates and 108 boreholes.

Two noteworthy advances were made in 1959. In the first place, firedamp drainage using extractor pumps was applied successfully to a larger number of seams, including the Barnsley, Haighmoor, Parkgate, Top Fenton, Thorncliffe, and Flockton. Secondly, drained firedamp was brought out directly to atmosphere by pipe (using surface extractor pumps) at four mines. The methane concentration in drained firedamp at surface plants was of the order of 65 per cent.

The yield per gate has ranged from about 15 to 270 cu. ft./min. methane, compared with an average methane rate of extraction from individual gates of 90 cu. ft./min. The total methane yield per mine has varied from 15 to 530 cu. ft./min., while the average methane yield per mine has increased from 30 to 190 cu. ft./min. Relevant details for November, 1959, are summarized in Table 1.

Application of Long Borehole Method of Firedamp Drainage

Boreholes are drilled upwards or downwards in strata surrounding wastes behind a coal face. In common return airways, boreholes may be drilled over or under wastes on the left- and right-hand side of the gate. Up-holes and down-holes are normally directed on a line parallel with the coal face, but both up-holes and down-holes have been given a forward lead towards the coal face in some cases.

Some individual up-holes, inclined towards the coal face, have given better methane yields than up-holes drilled parallel to the line of face. The difference between the yield of the two types of boreholes, however, has not been significant and the number of "better" and "worse" up-holes inclined towards the coal face appears to be approximately equal. The evidence available, therefore, suggests that from a yield (and purity) standpoint, forward inclination of up-holes gives little practical advantage. Waste edge and waste methane concentrations, however, do not appear, in general, to be as low with forward inclined holes as with boreholes drilled parallel to the coal face. In the case of gates containing special equipment (such as hydraulic equipment), application of forward inclined boreholes has the advantage that holes can be kept within close limits of the ripping lip despite the fact that it may not be possible to erect the drilling machine as near to the ripping lip as in the normal case.

Holes drilled at right angles to the centre line of a gate over solid rib sides have either produced no firedamp or comparatively small volumes of firedamp under suction. Individual boreholes drilled parallel or almost parallel to the edge of coal pillars, left to protect a main airway from an advancing flank coal face, on the other hand, have proved to be consistent in firedamp yield and purity once the coal face has advanced sufficiently far away from the pillar edge for initial weights and strata fracture to occur. As might be expected, the firedamp yield from "rear pillar edge" boreholes has remained constant and independent of the position of the advancing coal face.

Up-holes are generally drilled at angles varying from 35 to 50 deg. to the horizontal. Boreholes directed at the lower angles (say, about 40 deg. to the horizontal) tend to be more productive than holes drilled at higher angles and have given the most beneficial results in wastes and at waste edges. On the other hand, unless a sufficient length of standpipe in used, boreholes introduced at lower angles tend to have a short life, lower methane concentrations and intermittent firedamp yields.

When significant positive gas pressures have been encountered, low-angle boreholes invariably have produced good results. The angle of drilling boreholes may be effected by the dip of a seam.

Length of Standpipes and Boreholes

The length of standpipe varies from installation to installation and depends to some extent on the thickness and nature of immediate roof, seam thickness, inclination of borehole and local conditions. One of the most successful methods of determining the required length of standpipe is to observe the advance of the drilling machine during boring operations. Irregular and sudden advances of the

drilling machine can give a good indication of the height of the immediate roof.

The standpipe length of up-holes should exceed the inclined length of the immediate roof, so that the inner end of the standpipe is above the immediate roof. For example, in the workings of a 5-ft. thick coal seam, irregular movement of the drilling machine was observed over a vertical distance of 17 ft. or an inclined distance of 26.5 ft. in a borehole inclined at an angle of 40 deg. to the horizontal. In this case, a standpipe length of 30 ft. was selected and proved to be successful.

Experience in thick seams with a coal roof indicates that standpipes with lengths of about 25 ft. may be too short. In nearly all long borehole installations, successful and satisfactory results have been obtained with 30 to 35 ft. long standpipes. Good fitting of standpipe sections and firm grouting of standpipes are essential.

The length of boreholes depends among other things on firedamp horizons, strata formation, possible method of roof control, type of geological formation encountered and presence or absence of irregularities such as faults, washouts, and rolls. In the majority of cases, the length of borehole is determined initially after an examination of the geological section of the strata above or below a seam.

The matters given special consideration are the presence of thin coal seams, black shales, and sandstones. The length of borehole may be limited by a sandstone formation which may give rise to boring difficulties. In certain cases, the length of borehole may be governed by conditions found within wastes at the return end of a coal face. After the initial boreholes have been drilled, the length of subsequent boreholes is chosen in relation to results obtained. Presence of water-bearing strata may limit the length of boreholes.

In general, the length of boreholes ranges from about 60 to 300 ft., with an average probably of the order of 110 ft. In a number of instances it has been found advantageous to increase the length of boreholes. For example, in one district in the Barnsley Seam, the methane yield from individual boreholes has been almost doubled by increasing the length of borehole from about 120 to 200 ft. Length of borehole appears to be one of the principal variables in many firedamp drainage installations.

Boreholes are generally drilled at intervals of 25 to 30 yd. Such distances have been found necessary to ensure consistent results, and controlled methane concentrations at the ripping lips, at waste edges, in wastes, and in gate roadways.

Boreholes which are sited too close together, say, at 15-yd. intervals, over the same waste side are subject to mutual interference, and the total methane yield from adjacent holes may not be significantly different from that of one borehole. Drilling holes too close to one another may lead to a negative pressure on one or more of the boreholes. Provided the desired results can be obtained, therefore, the boring of holes too near to one another should be discouraged in order to limit the amount of physical work and to reduce the amount of borehole equipment required to achieve certain results and methane capture. Where two boreholes have been sited too close to one another, almost invariably it has been found necessary to isolate one of them from the gas main.

On the other hand, if the distance between boreholes is increased beyond the suggested distances where only small positive firedamp pressures, say, about 5 in. water gauge, are experienced, methane concentrations at the ripping lip, at waste edges, in wastes, and in the return gate may increase and the percentage capture in the district may decrease. In such instances drilling of additional boreholes at the requisite distance is accompanied immediately by improved results.

There is some evidence to suggest that, in very gassy districts where significant firedamp pressures exist, spacing of boreholes may not be as important a variable as in the general case. In such cases, boreholes drilled at 40-yd. intervals have produced the desired results.

Regular Drilling of Boreholes

Regular drilling of boreholes is essential for a successful firedamp drainage installation. Evidence available suggests that inclination of gate roadways, methane gradients in gate roadways, methane concentrations in wastes and at waste edges, and coal-face air flow rates are among the important variables governing the spacing of boreholes.

The inbye borehole is usually drilled at a distance of 10 to 15 yd. from the ripping lip. In most cases, the inbye borehole is productive as soon as it is coupled into the gas main, and thereby makes a direct contribution to the reduction in methane concentrations at the ripping lip, at waste edges, in wastes, and, in general, body methane concentrations at the coal face and return gate.

Practical considerations usually dictate that the minimum distance from the inbye borehole to the ripping lip should be about 10 yd., but this depends upon the type of equipment in the gate. In general, the inbye up-hole does not reach peak yield until it is about 30 yd. outbye from the ripping lip. In some instances, however, inbye boreholes have reached peak yields at a distance of only 10 yd. from the ripping lip.

On the other hand, if the inbye borehole is kept too far from the ripping lip, methane concentrations at the ripping lips, at waste edges and in wastes on the return side of a coal face may rise, even though constant pump suction is maintained, and the total rate of methane extraction from the panel remains substantially the same. In some faces in the Barnsley Seam, for example, it has been shown that methane concentrations at the ripping lip, waste edges, and in wastes increase if the inbye borehole is at a distance greater than about 40 yd. from the ripping lip.

The number of productive boreholes per gate varies from about three to 10 depending upon the type of installation. The number of productive

boreholes per gate is usually larger when short up-holes are used, and also when down-holes are necessary. The average number of productive boreholes per gate in the division is four.

Firedamp pressures met at boreholes immediately after making contact with productive gas horizons vary widely. In most cases, pressures are positive, being usually of the order of a few inches water gauge. In a number of cases, however, new boreholes, which later proved to be most productive, gave no indication of methane, gas pressure, or of gas flow.

The pressures encountered depend to some extent upon the firedamp characteristics of the seam being exploited and the related strata. Higher natural firedamp pressures appear to be encountered in the same seam in districts which give off more firedamp. Firedamp pressures also seem to be dependent upon the nature of the associated strata. Some evidence suggests that in the presence of impermeable strata, such as certain sandstones and fireclays, substantial gas pressure (of 3 to 5 lb./sq. in. or more) may be met even with small total methane flows.

In districts where moderate total methane flow rates are encountered in the Barnsley Seam (say, of the order of 250 cu. ft./min.), initial positive pressures of about 4 to 4.5 in. water gauge are common. In more gassy areas in the same seam and locality, however, firedamp pressures of about 3 lb./sq. in. have been measured. Substantial gas pressures are often met in coal seams where the total methane flow rate in the district is comparatively small (less than about 100 cu. ft./min.).

In moderately gassy districts, first boreholes almost invariably give larger contact pressures than subsequent boreholes in the same gates. For instance, in a number of gates in the Barnsley Seam, initial firedamp pressures at the first borehole are frequently about 4 in. water gauge positive. Later boreholes drilled in the same gate often give positive firedamp pressures of about 2 in. water gauge. In such cases, therefore, advance of the coal face, continuous firedamp extraction and drilling of new boreholes appear to reduce natural firedamp pressures despite regular face advance.

Stopping, or slowing, the advance of a coal face in general also causes natural firedamp pressures to fall if firedamp drainage is continued. On the other hand, delay in drilling boreholes in a district where the face continues to advance may give rise to significant firedamp pressures despite the fact that extraction continues from outbye boreholes. Little or no firedamp pressures are encountered at some boreholes in gassy seams. Small or insignificant positive pressures are characteristic of most short boreholes.

Where positive pressures are encountered in up-holes and firedamp is allowed to drain away naturally into a pipe system, firedamp pressures decrease with time. In some cases, equilibrium pressures are realized in three or four days; in other instances, a longer period may be required before a steady pressure is achieved.

In one gate, a contact pressure of about 25 in. water gauge fell to about 10 in. after four days under " free " flow conditions, as shown in Fig. 4. Thereafter, the gas pressure remained more or less constant even though firedamp was allowed to flow freely without pump suction being applied.

Where firedamp pressures are smaller, say, 4 in. water gauge, the time required to reach equilibrium pressures may be small and be only of a few minutes' or a few hours' duration. When borehole valves are closed, it is found with small positive pressure boreholes that the equilibrium pressure, obtained with free flow of firedamp, is exceeded and a higher pressure balance is obtained in a short time. For example, a positive equilibrium pressure of 2 in. water gauge under free flow conditions, rose to a positive pressure of 4 in. water gauge in a period of 1 or 2 min. after closing the sluice valve. Firedamp pressures remained almost constant thereafter.

Gas pressures measured at down-holes within the relaxed core often remain fairly constant and independent of time even though firedamp has been drained off continuously. The reaction of some boreholes with significant natural positive pressures to the closure of a valve is illustrated in Fig. 5 which shows a substantial pressure rise from atmospheric pressure to about 15 lb./sq. in. gauge in about 2½ min.

Composition of Firedamp at Boreholes under Free-flow Conditions

With firedamp issuing from boreholes under

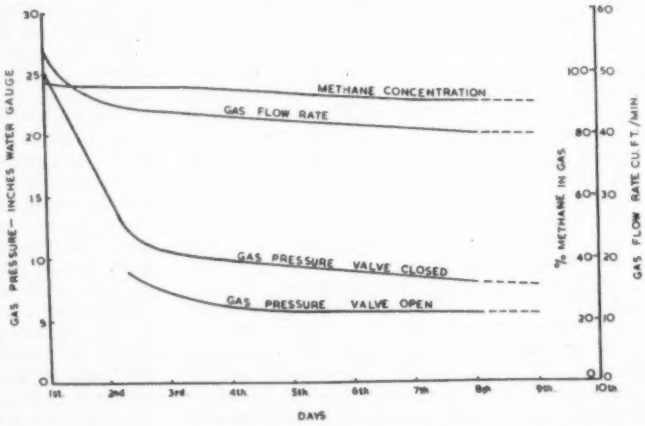


FIG. 4.—RATE OF FALL OF PRESSURE AND FLOW IN 10 DAYS AFTER A CONTACT PRESSURE OF 25 IN. WATER GAUGE.

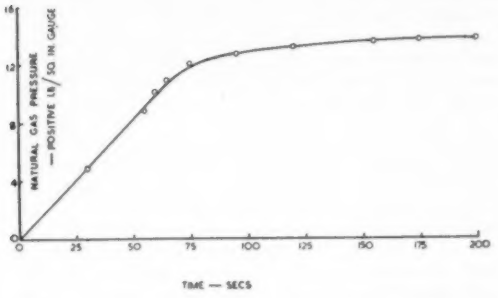


FIG. 5.—NATURAL PRESSURE BUILD-UP AT BOREHOLES.

positive pressure, methane concentrations are invariably high and appear to vary little under free flow conditions. Methane concentrations are usually of the order of 90 to 98 per cent. Samples takes from boreholes immediately after tapping principal gas sources have on analysis shown about 95 per cent. combustibles, 1.5 per cent. carbon dioxide, 3.25 per cent. nitrogen, and 0.25 per cent. oxygen.

Analyses of absorbed firedamp have shown that nitrogen, carbon dioxide, hydrogen, and a number of paraffin (saturated) hydrocarbons are present. In some instances, in addition, the existence of unsaturated hydrocarbon (ethylene) has been recorded. In at least one case, it appears that carbon monoxide has been found as a constituent of the adsorbed gas. The saturated hydrocarbons present in the adsorbed gas are mainly methane (CH_4), ethane (C_2H_6), and propane (C_3H_8). Some butane (C_4H_{10}) has been found in a few samples.

Samples taken from boreholes drilled in conjunction with firedamp drainage have been analysed by gas chromatography. Typical analyses of such gases gave the following results:—

(*a*) Carbon dioxide, 1.4 per cent.; methane, 86.3 per cent.; ethane, 2.2 per cent.; propane, 0.9 per cent.; butane, 0.5 per cent.; nitrogen, 8.5 per cent.; and oxygen, 0.2 per cent.

(*b*) Carbon dioxide, 1.0 per cent.; methane, 87.5 per cent.; ethane, 2.2 per cent.; propane, 0.6 per cent.; butane, nil; nitrogen, 8.3 per cent.; and oxygen, 0.4 per cent.

(*c*) Carbon dioxide, 1.0 per cent; methane, 90.4 per cent.; ethane, 2.2 per cent.; propane, 0.6 per cent.; nitrogen, 5.4 per cent.; and oxygen, 0.4 per cent.

When the above analyses are recalculated on an air-free basis, the resulting figures are:—

(*a*) CO_2, 1.4 per cent.; methane, 87.2 per cent.; ethane, 2.2 per cent.; propane, 0.9 per cent.; butane, 0.5 per cent.; and nitrogen, 7.8 per cent.

(*b*) CO_2, 1.0 per cent.; methane, 89.2 per cent; ethane, 2.3 per cent; propane, 0.6 per cent.; and nitrogen, 6.9 per cent.

(*c*) CO_2, 1.0 per cent.; methane, 92.2 per cent.; ethane, 2.2 per cent.; propane, 0.6 per cent; and nitrogen, 4.0 per cent.

In each case, the gas samples were taken before firedamp drainage was applied in the ventilating district.

The odour of firedamp appears to vary. In some cases, smells resembling hydrogen sulphide are present, in others a smell reminiscent of tar can be distinguished, whereas in some installations, an "oily" smell is encountered.

Initial firedamp flow rates ranging from 30 to 90 cu. ft./min. per borehole are fairly common in the Barnsley, Thorncliffe, and Parkgate seams. The corresponding figures for methane only would be of the order of 25 to 80 cu. ft./min. In particular, initial yield rates of 30 to 40 cu. ft./min. methane are representative of most boreholes in the Barnsley Seam, though, in exceptional cases methane yield rates of about 100 cu. ft./min. have been measured from first boreholes. Many first boreholes, however, yield little or no firedamp under natural pressure.

An indication of the variation of gas flow rate from a borehole with positive pressure is given in Fig. 4. It will be noted that over a period of about seven days the gas flow rate under free flow conditions decreased from about 50 to 40 cu. ft./min.

Most districts in moderately gassy or gassy seams give methane yield rates, from a number of boreholes, of about 30 cu. ft./min. under free-flow conditions (by-pass operation) in an established system of firedamp drainage where natural gas pressures are low. In such circumstances the actual flow is dependent partly on the length of gas main, the number of orifice plates, the valve operating positions and the vertical interval between boreholes and the discharge position.

Flow and Quality Characteristics Under Induced Conditions

In general, the following conditions apply when suction is applied to boreholes:—

(*a*) Very short up-holes require small suction pressures of about 1 to 2 in. water gauge.

(*b*) Suction pressures at long up-holes vary within very wide limits, usually from about 1 to 30 in. water gauge.

(*c*) Larger suction pressures may be required for down-holes, often of the order of 4 in. mercury or 54 in. water gauge.

The suction at a borehole may be governed by gas main layout, gas main sizes, number of pumps operating, pump speed, type of strata, in some cases by a desire to keep methane concentrations in the gas main to about 60 per cent., or by a desire to maintain oxygen and carbon monoxide constituents of drained gas at comparatively low values.

In most firedamp drainage installations, performance and results are directly related to the suction at boreholes. The suction applied to individual boreholes is controlled at the borehole itself, using a sluice valve coupled to the 3-in. bore steel piping, which is locked in the desired position. Alternatively, the applied suction could be varied by

changing the orifice plate size, but this method is too cumbersome, too slow and too inflexible to meet the immediate and changing needs of a firedamp drainage installation.

The effect of pump suction is rapidly lost when the extractor pump or unit is stopped as would be expected in the case of boreholes with substantial positive pressures of the order of 1 lb./sq. in. gauge or more. Observations show that change from negative to positive pressure is practically instantaneous, and that time required to realize equilibrium pressures decrease with increase in natural pressure.

In the majority of other boreholes, the effect of pump suction is lost in a few minutes. During the recovery period, following the removal of suction from a borehole, gas pressures build-up, either to a suction value smaller than the depression with pump suction when adjacent holes in a gate are interconnected to zero pressure, or to a positive pressure in terms of inches water gauge. At the same time, methane concentrations in the boreholes increase with the possible exception of some boreholes with little or no "natural" pressure.

An indication of the effect of removing suction from a typical borehole is given in Fig. 6A. In this case the pressure at an isolated borehole (outbye of the relaxed zone) increased from a depression of nearly 3 in. water gauge with pump operation, to a positive pressure of 0.75 in. water gauge at the equilibrium state after pump suction had been removed. The change occurred in about 5 min.

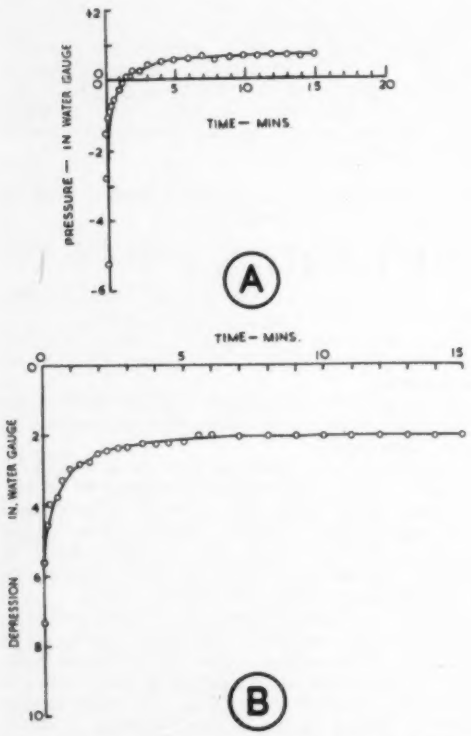


FIG. 6.—EFFECT OF REMOVING PRESSURE ON BOREHOLES OUTBYE (A) AND INBYE (B) OF THE RELAXED ZONE.

Fig. 6B shows the variation in pressure with time immediately after closing a borehole in the same gate at the outbye end of the relaxed zone. In this instance, isolating the borehole from suction resulted in the depression being reduced from about 7.25 in. water column with pump suction to an equilibrium value of 2 in. water gauge in about 5 min. The existence of suction on the borehole even with the vacuum pump isolated is attributed to the interconnection of a number of boreholes in the gate one with another, as other observations taken in the gate indicated. Pressure observations at other boreholes in the gate within the relaxed zone showed a negative equilibrium suction of about 1.7 in. water gauge when each borehole was isolated in turn from a constant pump suction.

Gas Compositions at Boreholes

When low or high firedapm pressures exist, the effect of applying suction to productive boreholes is to increase the amount of firedamp extracted, lower the methane concentration, and give rise to higher oxygen and nitrogen concentrations. This effect is particularly marked in flagging boreholes. The carbon dioxide concentration does not appear to be as sensitive to suction effect as the other constituent gases. With a few possible exceptions, carbon monoxide has been found to be a constituent of drained gas both in seams which are, and are not, generally considered to be prone to spontaneous heating. Methane concentrations in drained gas vary from about 40 to 93 per cent. In gassy districts the fall in methane concentration in drained gas with normal application of suction may only be about 10 per cent., giving drained methane concentrations of about 80 per cent. Examples of the composition of borehole drained gas are given in Table 2.

TABLE 2.—*Constituents of Drained Gas from Upward Holes.*

	Composition: Per cent. by volume.			
CO_2	O_2	CH_4	N_2	CO
0.81	1.48	87.37	10.34	0.0019
0.92	2.80	80.27	16.01	0.0006
0.80	4.19	73.51	21.50	0.0004
0.90	7.60	52.62	38.88	0.0031
0.77	9.70	45.52	44.01	0.0022
0.82	9.17	42.95	47.06	Nil

A general increase in oxygen and nitrogen percentages is indicated with decrease in methane concentrations. Drained gas from downward holes contains higher methane concentrations than drained gas from upward holes.

Generally speaking, there is a marked tendency for the first or second borehole outbye the ripping lip to give the highest methane concentration in drained gas in an established firedamp drainage system. It is noted frequently also that the methane concentration of drained gas from a fully produc-

tive inbye borehole tends at first to increase to a maximum as the distance from the borehole to the ripping lip increases. Beyond a certain distance, usually about 40 yd. outbye of the ripping lip, however, the methane concentration in drained gas from fully productive boreholes tends to decrease.

In addition, the inbye boreholes in a panel advancing to the rise (face on strike) show higher methane concentrations than the productive boreholes further outbye. Productive boreholes outbye of the relaxed zone tend to give gas with consistently high methane concentrations.

Methane and gas yields vary widely from borehole to borehole, and also from the individual borehole itself. Yield rates are closely related to the position of the borehole and the applied suction. The condition of the standpipe is also an important factor.

The methane yield rates from productive boreholes usually range from 7.5 to about 150 cu. ft./min. In exceptional cases, larger borehole methane flow rates have been experienced. Downward holes yield smaller methane flows than upward holes. The effect of suction on a productive borehole is shown in Fig. 7 where by the application of a suction of about 2½ in. water gauge, the methane flow rate was increased from about 35 to 105 cu. ft./min.

Analysis of results in the North-Eastern Division suggests that the most productive boreholes in a gate are likely to be the first two holes outbye the ripping lip in level seams. In panels advancing to the rise, the inbye borehole is most likely to be the most productive. Analysis also shows that, in general, the most productive borehole is found between 20 and 35 yd. from the ripping lip (if boreholes are outside the relaxed zone and exceptional cases are not considered). Often, first and second boreholes (outbye from the ripping lip), have similar methane yields. For example, in one gate from which the total methane rate of extraction was 242 cu. ft./min., the methane flow rates from the four individual boreholes in the gate were 75, 72, 45, and 50 cu. ft./min., as measured from the inbye to the outbye boreholes.

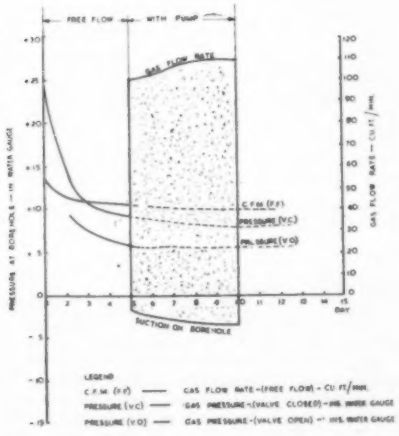


FIG. 7.—EFFECT OF APPLYING SUCTION ON GAS FLOWS FROM INDIVIDUAL BOREHOLES.

The current average methane yield per upward hole in the division is about 25 cu. ft./min. The average yield per downward hole is about 8 cu. ft./min. methane.

Book Review

Sea-coal for London. By Raymond Smith. Longmans, Green & Company, Limited, 48, Grosvenor Street, London, W.1. 63s.

IN this book Raymond Smith has provided a valuable addition to the literature dealing with the coal trade. It was originally intended to be a history of the Coal Factors' Society, but the author found himself forced into extending its scope so that it became virtually a history of the seaborne coal trade. It is largely concerned with the warfare between competing groups to gain control of the trade in the Thames. From the days of the Woodmongers until the formation of the Society of Coal Factors in 1832 there had been a constant struggle in which lightermen, shipmasters, shippers, colliery owners, and hostmen were all concerned. (The author provides the information that the hostmen of the middle ages were inhabitant householders to whom were assigned the duties of entertaining merchant strangers, of being answerable for them, and of supervising the sales and purchases of their wares.)

Raymond Smith makes it clear that it was the rise of the factors which ended the long spell of fighting for influence which had been marked by the serious misuse of power by those who attained it.

The period of transition from timber to coal which is the period covered by the book was an important one in the history of London River, and the fact that chaotic trading conditions gave way to honesty and orderliness is shown by Raymond Smith to be the result of the activities of the factors.

In the later chapters he brings the history up to date with descriptions of the modernization of transport and handling and information about the trade organization. A feature of the book, which is beautifully printed and bound, is the number of excellent plates and illustrations, including a coloured print of the London Coal Exchange in 1808. Col. Sir Ralph S. Clarke, chairman of the Coal Factors' Society, contributes a foreword.

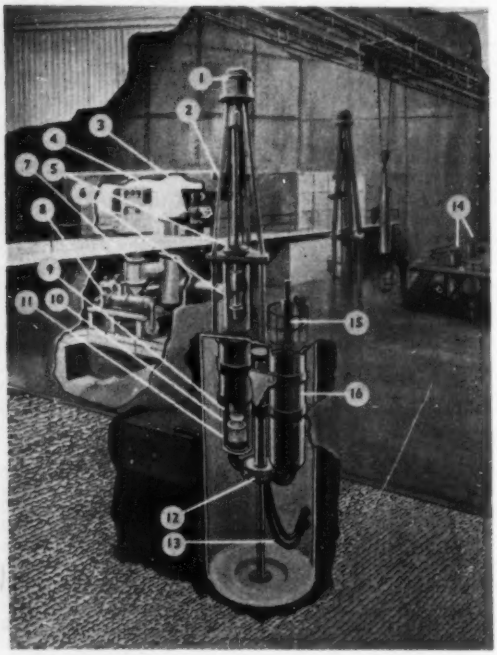
Increased Exports of Electrical Goods

The acceleration in the electrical industry's export drive, announced at the beginning of the year, has already produced record shipments. British electrical and allied engineering exports increased overall by 10 per cent. in the first nine months of this year, compared with the same period of last year, while exports to the Common Market countries showed an increase of 45 per cent. The export figures for the first nine months of the year were £238,000,000—£22,000,000 up on the corresponding period of last year and £27,000,000 up on the year before. The 10 per cent. rise compares with an increase of 4 per cent. in British exports as a whole.

Vacuum Melting Plant at Earls Court

CENTREPIECE of the Thos. Firth & John Brown, Limited, stand at the second Engineering Materials and Design Exhibition, held at Earls Court last month, was a scale model of the company's vacuum melting plant.

Vacuum remelted steel made by the consumable arc process is available from the company in ingots from 12 in. to 26 in. dia. (10 cwt. to 7 tons in weight). The process is used to refine, still further, steel made by normal electric steelmaking procedure and produces the cleanest steels commercially available; it also offers advantages in freedom from segregation.



SCALE MODEL OF THE THOS. FIRTH & JOHN BROWN, LIMITED, VACUUM MELTING PLANT SHOWN ON THE COMPANY'S STAND AT THE SECOND ENGINEERING MATERIALS AND DESIGN EXHIBITION.

1.—Electrical lowering gear. 2.—Flexible power cables. 3.—Optical viewing system. 4.—Control desk. 5.—Vacuum seal. 6.—Furnace chamber. 7.—Dust separator. 8.—Vacuum pump equipment. 9.—Consumable electrode. 10.—Water-cooled copper mould. 11.—Vacuum melted ingot. 12.—Hydraulic lifting device. 13.—Water supplies. 14.—Spare moulds. 15.—Consumable steel electrode. 16.—Second mould in charging position.

Such steels are being used extensively for aircraft gas turbine discs, special bearings, and other applications where cleanness, ductility, and improved fatigue resistance are of paramount importance.

REVISED BRITISH STANDARDS FOR IRON AND STEEL

METHODS for the analysis of tin and nickel are laid down in two revised British Standards recently issued. Two other revisions concern, respectively, cast-iron pipes and the testing of metals.

BS 1121—Methods for the Analysis of Iron and Steel: 1121, Part 20, 1961: Tin in Iron and Steel (2s. 6d.), describes a method applicable to iron and steel containing up to 0.25 per cent. tin. 1121, Part 37, 1961: Nickel in Iron and Steel and Permanent Magnet Alloys (4s.), describes two methods applicable to iron and steel and permanent magnet alloys. Method A covers the range of nickel contents in iron, steel, and permanent magnets of the aluminium-nickel-cobalt type, provided that the cobalt in the test solution does not exceed 0.15 g. Method B is intended for cobalt steels containing up to 0.25 per cent. nickel, where the amount of cobalt in the test solution exceeds 0.15 g. This method supersedes BS 1121, Part 2, which is now withdrawn.

BS 78—Cast-iron Spigot and Socket Pipes (Vertically Cast) and Spigot and Socket Fittings 78, Part 1, 1961: Pipes (5s.), specifies cast-iron spigot and socket pipes vertically cast for the conveyance of water, gas, and sewage, and for such other purposes for which their characteristics render them suitable. The nominal internal diameters of pipes specified are in the range 3 in. to 48 in. for Grades A, B, C, and D. Information is given regarding the quality of metal used, the mode of casting, the test requirements, the coating to be applied, and testing facilities. Tables are included giving the weights of standard pipes, the thickness and external diameters, and dimensions of standard spigots and sockets.

BS 427—Vickers Hardness Test: 427, Part 1, 1961, Testing of Metals (15s.), defines test requirements and procedure for carrying out the Vickers hardness test on metals and includes comprehensive tables of hardness values applicable to tests on flat surfaces with loads in the range of 1 to 100 kg.-force. Also included are tables giving correction factors necessary when making tests on spherical or cylindrical surfaces and guidance concerning the minimum thickness of test pieces.

Iron and Steel Translations

The British Iron and Steel Industry Translation Service has issued a cumulative list, "Iron and Steel Translations 1959/60," to supplement the two previous ones, 1957/58 and 1958/59. It contains over 550 translations, arranged by subject, with a subject index; the author index also covers the two previous lists. More recent translations are recorded in bi-monthly lists, which serve as a guide to wide selection of foreign publications on iron and steel. They are all available free on request from BISITS, Iron and Steel Institute, 4, Grosvenor Gardens, London, S.W.1.

Metallurgical Progress

Some abstracts from recent reports on research and developments, at home and abroad

Consumable-electrode Melting of Steels—Present and Future. W. W. DYRKACZ. (Metal Progress, 1961, Vol. 79, No. 5, pp. 65-70.) Since its adaptation to speciality steels and super-alloys, consumable-electrode vacuum melting has proved to be a valuable technique for obtaining cleaner ingots which have a lower gas content and better mechanical properties than comparable air-melted ingots. The method is suitable for several of the new metals and alloys which cannot be melted economically, or with any degree of predictability of yields and quality by conventional methods.

Larger remelting units are being built, and ingots of up to 50-in. dia. and weighing approximately 30 tons will soon be available. With this increase in ingot size and the experience being gained with large-quantity production, the selling prices of a number of steels and super-alloys have been reduced considerably in the United States during the last two years. Such price reductions are stimulating the use of vacuum-melted steels for a number of applications.

Deoxidizing Steels by Vacuum. G. E. DANNER and E. DYBLE. (Metal Progress, 1961, Vol. 79, No. 5, pp. 75-78.) When unkilled steel is stream degassed in a vacuum, included oxygen will unite with the carbon in the steel, and boil off as carbon monoxide. Since no metallic deoxidizers are used, there is a direct decrease in the quantity of non-metallic inclusions. Also, the gas content is lowered. In general, oxygen contents in vacuum-deoxidized steels vary between 20 and 30 parts per million. Hydrogen contents of vacuum-deoxidized steels appear to be lower than those of vacuum-degassed steels. The tensile, ductility, and impact properties of vacuum-deoxidized steels are comparable with those of vacuum-degassed steels.

Argon Teeming: Extra Refinement to Vacuum Degassing of Steel. ANON. (Iron Age, 1961, Vol. 187, No. 20, pp. 146-148). Two new methods are improving aircraft-quality alloy steels. One is a method of pouring vacuum-degassed steel through a blanket of argon gas into ingot moulds filled with argon. The other is the development of a method to put additives into the molten steel while the ladle of steel is under a high vacuum inside the degassing chamber. A vacuum treatment of about 15 min. reduces hydrogen by 2/3, oxygen by a 1/2, and nitrogen by 1/3.

Tests were carried out with 40-in. ingots, each weighing 17.5 tons. Two heats were used. On the first heat, one ingot was air teemed and the second ingot was argon teemed. The order was reversed for the second heat. Results show that a definite gas pick-up occurs during teeming in air. The mechanical properties of the alloy steel after degassing and argon teeming were 190,000 to 210,000 lb./sq. in. tensile strength; 178,000 to 195,000 lb./sq. in. yield strength; and elongation of 9.5 to 13.5 per cent. Results of a magnetic-particle inspection showed a frequency of 4.5 indications per sq. ft. of inclusions 1/10 to 1/8 in.; 1.5 for inclusions over 1/8 to 1/4 in.; 0.13 for inclusions over 1/4 to 1/2 in.

Alloy Improves Service of Galvanized Products. ANON. (Steel, 1961, Vol. 148, No. 24, pp. 154-157.) Small additions of magnesium to zinc baths for galvanizing improve the corrosion resistance of the product. The best range is 0.03 to 0.05 per cent. magnesium with 1/10 that amount of aluminium. Also, it is claimed that the appearance of the coating is improved and the mechanical properties are maintained. The tests have been carried on for six years. These tests show varying amounts of improvement in corrosion resistance, ranging from a low of 20 to a high of 90 per cent. The magnesium must be made to dissolve in the zinc. It is pickled clean, rinsed in water, dried, and floated on the surface of the bath. As the magnesium floats on the zinc, an alloy is formed of about equal parts of each. The alloy is molten at the bath temperature. The alloy is stirred with a flux paddle as it is formed. The high-zinc alloy forms in small crystals which rapidly go into solution.

The Use of the Open-coil Process to Change Composition and Improve Sheet Steels. J. A. BAUSCHER. (Iron and Steel Engineer, 1961, Vol. 38, No. 5, pp. 73-81.) The novel feature of open-coil annealing is the provision of space or separations between the individual wraps of a coil, so that hot annealing-atmosphere gas can be circulated through the separations. The entire coil is heated and cooled much more rapidly and more uniformly than in conventional box annealing. Also, it has been found that desirable gas-metal reactions can be carried to completion when the coil is open during annealing.

In the experimental work, properties equivalent to those of box-annealed rimmed and aluminium-killed steels were developed with a soaking time of 2 hr. All the tinplate tempers can be produced by open-coil annealing of the normal grades of tinplate steel. For the most economical annealing of drawing-quality sheets and tinplate, a rotary hearth with the necessary coiling equipment has been designed. When the carbon content of rimmed steel is reduced to 0.005 per cent. or less by open-coil annealing for about 6 hr. in a moist annealing gas (8 per cent. hydrogen and 92 per cent. nitrogen gas and deoxidizing gas), the steel is suitable for conventional two-coat enamelling, or for one-coat or direct-on enamelling.

It has been determined that non-ageing rimmed steel can be produced by removing virtually all the

carbon and nitrogen from the steel during open-coil annealing in moist hydrogen and in moist 70 per cent. hydrogen, 30 per cent. nitrogen gas. The nitrogen content of cold-reduced coils of low-phosphorus steel has been increased from 0.003 to 0,030 per cent. by short open-coil annealing cycles using ammonia as the source of nitrogen. The nitrogen is uniformly distributed throughout the thickness of the steel.

A Review of Iron-ore Sintering. J. H. PORTEUS. (Iron and Steel Engineer, 1961, Vol. 38, No. 5, pp. 144-155.) The author gives a partial review of the history and development of iron-ore sintering, emphasizing the developments of the last decade, in which more progress has been made than in the 40 years from 1910 to 1950. The sources of supply are changing and the plant must be prepared to handle a mix of several ores of different physical and chemical compositions, in varying proportions, as the economic picture changes, and to produce guaranteed tonnages of uniform, quality product. Almost all sinter plants have flux in the finished sinter, the amount varying from a portion of the furnace requirement to the full amount needed to carry the sinter burden in the furnace (self-fluxing sinter), or the sinter can be overfluxed with the amount needed for the entire furnace charge (burden-fluxing sinter).

In addition to sintering, there is considerable current interest in pelletizing and briquetting. Today much attention is paid to the proportioning of the raw materials in the amounts required, and equipment of great reliability and high accuracy is required. The automated plant includes more than the materials-proportioning system. The central computer controls conveyor speeds, the amount of recirculated fines, the mixing and conditioning system, the machine and cooler speeds, the burning-through point, the bed depth, and the fans. In the last few years there have been some significant improvements in sinter plants. For delivering to the machine, the best of the conventional devices is a roll feeder with material distributed across its width by an oscillating or reciprocating conveyor.

Improvements have been made to the sinter machine, the machine-drive gear, and at the discharge end of the machine. All modern plants incorporate hot screening and air cooling of the sinter. As a large (and increasing) proportion of the furnace burden is handled through the sinter plant, the best location involves careful study of an integration into the material handling of the overall plant, for both present and anticipated future needs.

Sendzimir Mills Tuned Up to Roll Thin Tinplate. ANON. (Steels, 1961, Vol. 148, No. 25, pp. 96-99.) The Sendzimir mill can be used to advantage for reducing steel from the hot-strip mill to final gauge, in several passes, or it can be used for the final reduction of strip from a 5-stand, tandem mill. Low-carbon steel strip of the type used to make tinplate has been rolled satisfactorily on the Sendzimir mill during tests.

Tungsten carbide work rolls are used on the mills to maintain a superior surface on long production of re-rolled tinplate. The mills are capable of making reductions up to 50 per cent. per pass. The back-up bearings are built in segments and each segment is mounted on an eccentric ring. The rotation of the eccentric changes the pressure applied by that bearing on the roll cluster. Individual adjustment of the bearings across the strip width permits the operator to change the shape of the roll opening to correct strip shape or crown. Lateral adjustment of intermediate mill rolls makes it possible to roll strip of several widths, shapes, and hardnesses with minimum set-up time. The mill housing is designed so that the deflection is distributed across the entire strip width.

The capacity to roll wider sheets or strip would make it possible for a Sendzimir mill to handle coils from a 72-in. hot-strip mill. Subsequent slitting would produce two 36-in. wide coils for tinplating. The efficiency, capacity, and yield of a tandem mill are increased when the mill is teamed-up with a Sendzimir unit.

The Rolling of Ultra-thin Tinplate. M. D. STONE. (Iron and Steel Engineer, 1961, Vol. 38, No. 6, pp. 67-77.) Some of the various possibilities for the commercial production of ultra-thin tinplate are reviewed. In recent times the average tinplate gauge produced has been around 80 lb. per base box (0.009 in.), but now the industry is being confronted with producing at half these gauges in commercial quantities and at attractive prices. The range of gauges in commercial quantities and at attractive prices. The range of gauges which might be called "ultra thin" are from 0.006 to 0.003 in. with a median of 0.0045 in.

Tests have been carried out on a modern 5-stand mill, having a top finishing speed in excess of 6,000 ft./min., with separate generators driving each of the mill motors, and using palm oil directly applied plus copious quantities of cooling water. An 0.070 by 29 in. harder tinplate material was rolled down to 0.0044 in. at both low and high speeds (up to 4,400 ft./min., effecting an overall elongation of 0.0700 in./0.0044 in. or 16 to 1 which was attained by operating at partial voltages on the earlier stands.

The energy consumed, when rolling at 4,400 ft./min., was 148 h.p.-hr. per ton. An analysis of the rolling pressures, particularly on the last stand, shows them to be increased considerably, of the order of 80,000 lb. per in. of width, compared with about 50,000 lb. per in. when rolling 80 lb. per base box in the conventional manner. This higher specific rolling load results in a maximum Hertzian contact stress between the work rolls and the back-up rolls of about 225,000 lb./sq. in. For this specific rolling pressure, the total rolling load for 29-in. wide material is 1,150,000 lb. per bearing, which is satisfactory for oil-film bearings at the high rolling speeds used. Automatic gauge control has made it possible to reduce the length of off-gauge heavy ends.

From a comparison of three 5-stand tandem tin-

plate mills, the top operating speeds and production can be associated with the effectiveness of the roll coolant-lubricant systems employed. A 6-stand tandem cold mill is scheduled to operate this year and will have a maximum operating speed of 7,000 ft./min., will use 24-in. dia. rolls on the last stands, and will be provided with up to 11,500 gal./min. of rolling coolant/lubricant.

Automation and Process Control in the Soviet Iron and Steel Industry. W. E. MILLER and R. M. SILLS. (Iron and Steel Engineer, 1961, Vol. 38, No. 6, pp. 78-86.) All indications are that the USSR has placed its economic future in the hands of the automation and the systems engineers. The extreme concentration on the development and application of advanced automation theory and techniques is expected to raise product quality and productivity of the individual worker to levels surpassing that of the western world in 5 to 10 years' time. The importance of automation to the development of the Soviet economy is constantly being explained to the populace.

There is considerable interest in automated reversing hot mills. Experiments in automatic operation have been proceeding since 1954. The system involved complete modernization of auxiliaries and an automatic operation utilizing photo-electric relays. A screw-down system utilizing transformer-type simulator and feedback selsyns geared 10 to 1 was included. Today there is one digital system on a structural mill, but generally selsyn systems are used. Coded sensors and sample data have been developed for positioning systems and transistorized photo-electric relays are being used for position checking and reversing hot mills.

In hot-strip mills, gauge control over the main body of the coil is achieved through operation of the screw-downs. Tail-end gauge correction is done by strip-tension control by changing the set values of the motor-speed regulators. Width gauges are used on hot-strip finishing mills. Optical-mechanical systems of good accuracy are claimed. The Soviets have done considerable process and system analytical work on tandem cold-mill automatic gauge control.

A gauge-control system for a 3-stand tandem mill utilizes stand screw-down and stand speed control. Gauge is measured after stands 1 and 3. Stand 1 gauge error is also fed forward to change stand 3 speed after a transport time. The feed-forward transport compensation is by an endless magnetic tape. Equipment used to check for examinations and slag inclusions in slabs, plate, and strip indicates defects as small as 0.155 sq. in. in material up to 3.15 in. thick and up to 9.8 ft. wide by 163.5 ft. long. The test is performed in 16 sec. with a 1.5 megacycle ultrasonic scanning system.

The Application of Process-control Computers in the Steel Industry. W. E. COLEMAN and F. SLAMAR. (Blast Furnace and Steel Plant, 1961, Vol. 50, No. 4, pp. 331-336.) The general form of a processing system is one in which a multiplicity of inputs, such as the physical and chemical characteristics of the raw materials, the energy levels, the machine settings, etc., are used to provide desired outputs, such as product quality, productivity, and minimum cost, or some selected combination of these. One of the most effective ways to exercise process control is through feed-back control. By this method, the actual output is compared to the desired output and necessary corrective actions are taken to eliminate any discrepancies.

A computer-controlled system primarily denotes a degree of complexity of control rather than a basically new concept. As most processes in the steel industry employ feed-back control, whether the loop is closed by an operator or automatically, it is important that corrective actions be determined and executed in times that are short compared to the major delays of the process. A computer-control system accepts the quantitative values of the many processing variables and executes its control function based on these values. A prime requisite is instrumentation which will adequately translate a process variable from its physical or chemical units to a form suitable for use by the computer.

Computer-control equipment typifies the extent of technical advances in modern control equipment, in which complex computations can be completed in fractions of a second, decisions can be made quickly on appropriate control action, information can be stored for long periods of time and recalled when required, and self-checking of the equipment can be carried on continuously. On-line process computers are appearing in various operations, such as sintering, continuous annealing, hot-strip finishing, electrolytic tinning, and rolling.

The Importance of Gas Cleanliness for Increased Production on Blast Furnaces. H. GOLDFEIN and H. BOEHME. (Blast Furnace and Steel Plant, 1961, Vol. 50, No. 5, pp. 407-412.) The authors show how, by increasing the efficiency of the gas-cleaning equipment, high blast temperatures could be used to increase output. In the face of rising construction costs and the development of competing processes, *i.e.*, direct reduction, it has become imperative that the operators of blast furnaces increase the efficiency of their existing installations. To fully utilize the recent advances in instrumentation, beneficiation, and technology, new auxiliaries can be the first step towards greater efficiency.

Inland Steel Company's No. 3 plant increased gas cleanliness and installed larger burners. Scrubbers were installed in place of the water seals. The scrubbers are 18 ft. 6 in. dia. and have a venturi throat area of 7.81 sq. ft. The sprays are operated at 900 gal./min. with a nozzle pressure of 20 to 22 lb./sq. in. Prior to the installation of the scrubbers, the dust load of the gas in the stoves averaged 0.035 gr./cu. ft., and from 1954 to 1958 the precipitators were down for cleaning 15 times. Since 1958 and the installation of the scrubbers the dust load has averaged 0.003 gr./cu. ft., and it has not been necessary to shut down the precipitators for cleaning, and cleaning will not be necessary for several more years.

The authors do not claim that cleaner gas alone enabled this company to increase production. It is recognized that better raw materials and humidified blast were the prime factors. However, without clean gas, the full advantage of beneficiated burdens and steam would not be possible. To use steam, natural gas, and beneficiated burdens effectively and efficiently, high blast temperatures are necessary. To get them, clean gas is most essential.

Production Aspects of the Dwight-Lloyd McWane Ironmaking Process. H. E. ROWEN and C. D. THOMPSON. (Iron and Steel Engineer, 1961, Vol. 38, No. 6, pp. 90-96.) The pre-reduction smelting method is a process which has been developed through utilization of a combination of common equipment units, which are in general use in the iron-smelting industry. The process avoids the use of reactors requiring high temperatures, pressures, precisely controlled atmospheres, or exacting control of heat zones. Crushed ore and non-coking coal are fed by means of belt-feeder scale controls.

The fluxes are added to the burden belt which discharges them into a ball mill where they are ground into an intimately mixed pulp of the desired particle-size range. The pulp discharges to a pump which forces it up to the filter, mounted on top of a feed-surge bin. The bin feeds the main-charge belt, with close-quantity control available through an adjustable gate and feeder speed. The proportioned charge burden proceeds up an inclined belt where it passes through a fluffing unit. The fluffer consists of rapidly rotating cross blades, which pick the charge from the belt, aerate it, and throw it forward on to the belt. A cross belt carries the material to the pelletizing unit.

The pellets, each containing the desired quantities of ore fines, coal fines, and fine fluxes, are placed on the sintering machine by an inclined swing-belt feeder.

Bed depth is regulated so that the down-draught heat wave and reaction waves of the calcining and carbonizing zones will reach the grate bars without burning off excess fixed carbon in the top of the bed and without reoxidization of the upper layers of pellets, as discharge occurs. The first treatment zone is a drying stage. Gases from the hot zones are drawn down through the bed. The second zone is the ignition stage. A simple torch or burner is all that is required. The pellets pass to the calcining and carbonizing zone, which is covered by a continuation of the same hood which covers the other two zones. The ore and fluxes are firmly bonded in the red-hot pellets by a char-coke formed during a third stage. Hot pellets are transferred from the sintering machine to a submerged three-electrode furnace. The pellets are deposited in the furnace by means of a feed hopper which discharges in the centre of the electrode triangle.

Dealing with Fume from the Open-hearth Furnace. W. STRAUSS. (Iron and Steel Engineer, 1961, Vol. 38, No. 6, pp. 98-102.) The increased use of oxygen in the open-hearth furnace has increased dust concentration in the waste gases. Certain mechanisms can be used to remove the fume particles from the furnace waste gases. (1) Impingement and interception of the fume particles by fine fibres, other small particles and/or droplets, these being all of the same order of size as the fume particles. (2) Diffusion to a surface across a concentration gradient. (3) Thermal precipitation through a thermal gradient. (4) Electrostatic precipitation. (5) Magnetic separation of the particles at temperatures below the Curie point of the material. (6) Agglomeration of the fumes as a precursor to mechanical separation. All these methods have been found to be successful in practice, so the author discusses their application in detail.

Satisfactory methods of cleaning open-hearth furnace gases must have an overall efficiency of at least 98 per cent., and the only methods achieving this, which have been tried on a plant scale, are electrostatic precipitators, and in one case, a bag-filter house.

Recent developments in artificial, glass, and quartz fibres will extend the use of filter bags. The capital cost of the electrostatic precipitators is high, and although the new fully automatic bag houses are cheaper, the final answer can be given only when a satisfactory bag "life" has been achieved. As neither method removes SO_2 it is important that the gases leave the stack at about 200 deg. C. for the plume to rise, because of the buoyancy of the gases, and disperse the SO_2 at a great height.

A venturi scrubber will remove some of the SO_2, but the power costs are high and the gases are discharged almost at ambient temperatures. More hope can be attached to the developments of an effective slag-wool filter, and perhaps beds of granulated refractory material. Both units have been shown to be capable of high efficiencies, although not as high as may be obtained with electrostatic precipitators or bag filters.

Mallory 328 Resistance Welding Alloy

A NEW resistance welding electrode alloy, Mallory 328, has been introduced by Johnson, Matthey & Company, Limited, 73-83, Hatton Garden, London, E.C.1. Developed from long-established Mallory 3, the new alloy has an equally high electrical conductivity with slightly greater hardness at room temperature. The outstanding characteristics of Mallory 328 are its far better retention of strength and hardness at higher working temperatures, its superior elongation, and its greater resistance to cracking under severe welding conditions, which make it an excellent electrode material for welding all types of steel, especially coated steels.

Mallory 328 rod is available from stock in a number of standard sizes, which other sizes of rod, seam welding wheels, and forged bars are produced to order.

CHILEAN iron-ore production, which has doubled in the past 10 years, is now the nation's second most important mining activity, occupying the position traditionally held by nitrates.

Hydraulically Controlled Loading Point at Bold Colliery

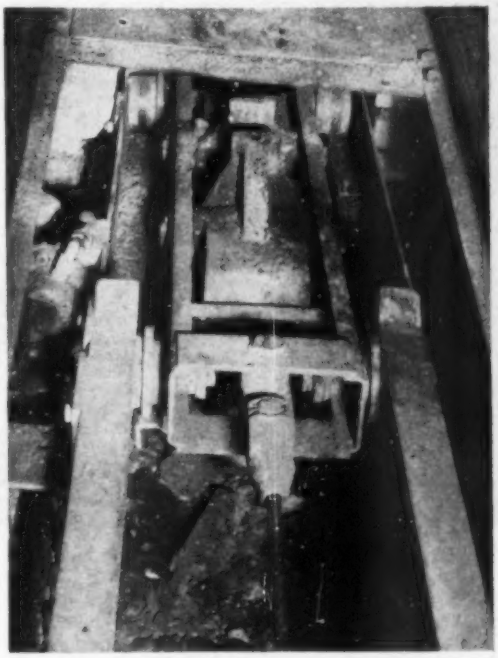


FIG. 1.—THE HYDRAULICALLY CONTROLLED "MULE" FOR HANDLING EMPTY MINE CARS.

If the high productivity now being obtained by the mining industry from mechanized faces is to be maintained, the output from such faces must be handled by the minimum of labour. This article describes the West Rushy Park loading point at Bold Colliery, which is capable of handling an output of between 6,000 and 7,000 ton/week by one man and a locomotive driver.

RECONSTRUCTION at Bold Colliery in No. 3 (West Lancashire) Area of the North-Western Divisional Coal Board, which started in 1949, has now been completed, and productive capacity from the Rushy Park and Wigan 4-ft. seams, reached by deepening Nos. 1 and 3 shafts from 738 yd. to 915 yd., is being developed to expand the output of the colliery.

The districts and faces serving the two seams are laid out to produce maximum output at a high productivity and the loading point serving the West Rushy Park district, which has a life of 10 years at a weekly production of between 6,000 and 7,000 ton/week, is an example of how efforts are being made to maintain a high output per manshift with minimum labour. The Rushy Park Seam is 4 ft. 3 in. thick and the West district contains an area of coal approximately 700 yd. wide and 1¼ miles in length, with the measures dipping at an average gradient of between 1 in 7 and 1 in 9 in the direction of the length of the area. It is bounded by upthrow and downthrow faults on the eastern and western flanks, respectively, which gradually converge to the south and form an elevated triangular area of coal.

The district is being opened out by a development face 120 yd. long, which is skirting the northern boundary. The face is equipped with an Anderton shearer fitted with a spiral-vane disc to improve the percentage of large coal, and is supported by hydraulic props and link bars. Access to the face is by three gate roadways, two of which are of 12-ft. by 9-ft. section, and the other 6-ft. by 6-ft. section forming out the flank units. While in the development stage, the district's output is 2,500 ton/week and the face and district productivity is 8 and 5.5 tons, respectively.

A weekly advance of 14 yd. is being maintained at the face by completing almost four shears per day with the 30-in. wide drum on two-shift working.

By the end of the year, a 275-yd. face, equipped with an AB 125-h.p. Anderton shearer and supported by Dowty Roofmasters, is expected to produce between 6,000 and 7,000 ton/week by working the Rushy Park Seam to the dip.

In planning the district a high-capacity loading point, to cater for high peak loading rates, was justified, and Richard Sutcliffe, Limited, Horbury, Wakefield (Yorks), was approached to design, to

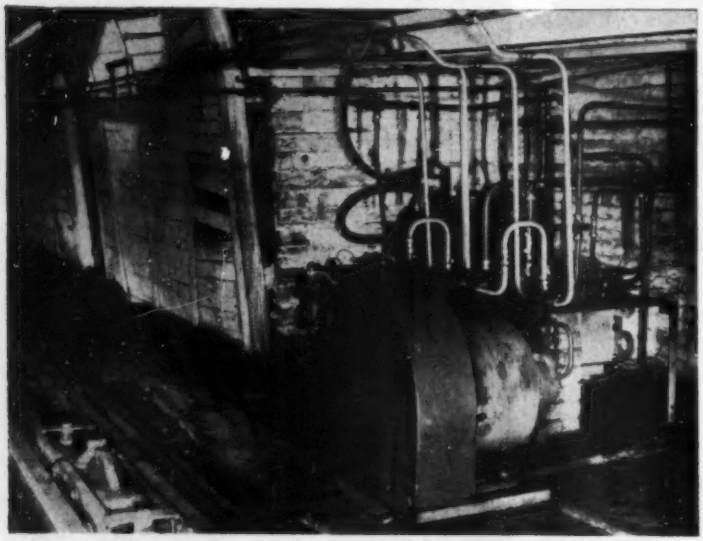


FIG. 2.—ROPE DRIVE UNIT AND POWER PACK.

the board's specification, a hydraulically controlled loading point which could be operated by one man. The output from the loading point is hauled to the No. 1 pit bottom in trains of 60 30-cwt. mine cars by battery-driven locomotives.

The hydraulic equipment at the loading point, is installed in a roadway some 16 ft. by 13 ft. and consists of a rope-hauled "mule," for controlling empty mine cars, and a retarder and spotting creeper under the boom end of the belt for controlling the loaded cars.

The hydraulic mule, shown in Fig. 1, is a carriage which receives the empty cars from the locomotive and controls their movement to the loading point.

The mule runs in separate 18-in. wide tracks formed from channel girders and laid between the 2-ft. 3-in. gauge mine-car track. It is fitted with two pivoted horns arranged in opposition to engage with the dummy axles of the mine cars, the horns ensuring that movement of the mine car in both directions is completely controlled during its handling at the loading point. The mule engages and disengages with the empty cars by ramps at each end of the mule track which raise or lower the mule to accept or release the dummy axles of the mine cars.

The $\frac{3}{4}$-in. dia. Langs lay rope which hauls the mule is arranged on the reversible endless principle and is driven by a hydraulic motor receiving its oil supply through a 14-gal./min. pump powered by a 25-h.p. electric motor. A secondary 2-gal./min. pump is driven by a common shaft from the same motor and is arranged to unload the 14-gal./min. pump under stalled conditions. The rotary hydraulic motor, driving the 32-in. dia. surge wheel through a 23.6 to 1 epicyclic reduction gearbox, gives a rope speed of 80 ft./min. and develops a tractive force of 4,000 lb.

The rope drive unit and the hydraulic power pack (Fig. 2) are situated approximately midway along the shunt. The rope passes twice round the surge wheel and is tensioned at the inbye end of the installation by a screw-operated slide, which adjusts the position of the 3-ft. dia. return wheel.

The spotting creeper (Fig. 3) consists of a 10-in. pitch, bushed double-strand roller chain with pivoted horns, which allow the mine car to be pushed in one direction. The chain is driven by cast-steel sprockets mounted on a steel shaft running in plummer blocks. The tail sprockets, also of cast steel, are mounted on a steel shaft running

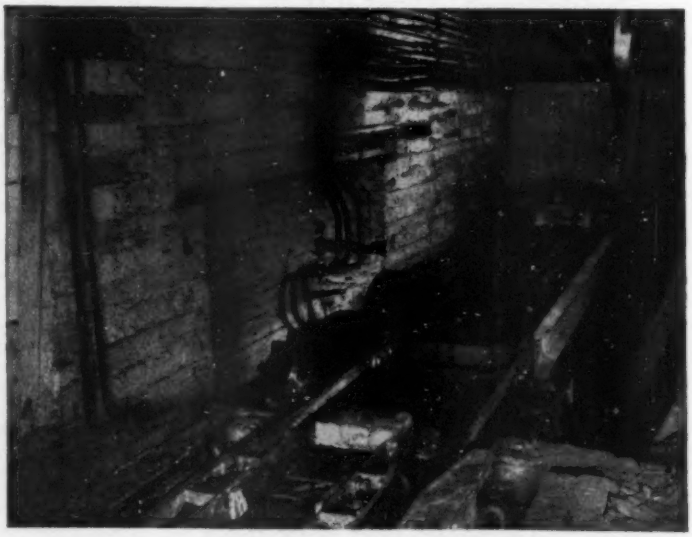


FIG. 3.—SPOTTING CREEPER FOR CONTROL OF MINE CARS DURING LOADING OPERATIONS.

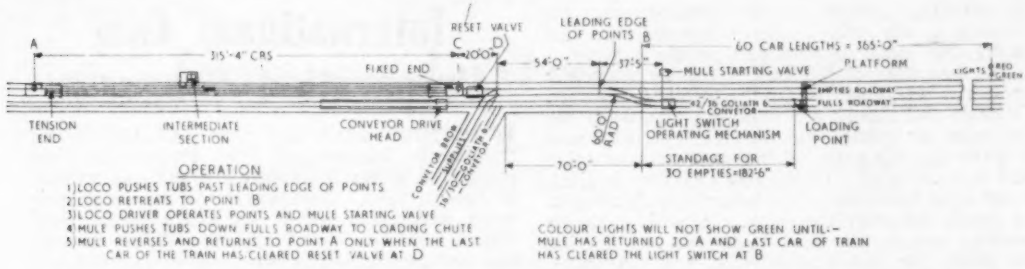

A
315'-4" CRS
RESET VALVE
C
D
200'
FIXED END
54'0"
LEADING EDGE OF POINTS B
37'5"
60 CAR LENGTHS = 365'0"
MULE STARTING VALVE
PLATFORM
LIGHTS
RED & GREEN
EMPTIES ROADWAY
FULLS ROADWAY
#2/36 GOLIATH 6 CONVEYOR
TENSION END
INTERMEDIATE SECTION
CONVEYOR DRIVE HEAD
CONVEYOR RISE 1 IN 10 CIRCULAR 1 IN 10 CURVATURE
30'0" RAD
LIGHT SWITCH OPERATING MECHANISM
LOADING POINT
70'0"
STANDAGE FOR 30 EMPTIES=182'6"
OPERATION
1) LOCO PUSHES TUBS PAST LEADING EDGE OF POINTS
2) LOCO RETREATS TO POINT B
3) LOCO DRIVER OPERATES POINTS AND MULE STARTING VALVE
4) MULE PUSHES TUBS DOWN FULLS ROADWAY TO LOADING CHUTE
5) MULE REVERSES AND RETURNS TO POINT A ONLY WHEN THE LAST CAR OF THE TRAIN HAS CLEARED RESET VALVE AT D
COLOUR LIGHTS WILL NOT SHOW GREEN UNTIL:-
MULE HAS RETURNED TO A AND LAST CAR OF TRAIN HAS CLEARED THE LIGHT SWITCH AT B

FIG. 4.—LAYOUT OF THE EQUIPMENT AND OPERATION OF THE WEST RUSHY PARK LOADING POINT AT BOLD COLLIERY.

in tension blocks with ample take up. The main frame of the unit is built of braced roller sections.

The creeper is driven by a separate power pack from that operating the mule and consists of a hydraulic motor receiving its supply from an electrically driven dual output pump, delivering 40 and 20 gal./min., respectively. By combining the output of these pumps, speeds of 23, 46, and 69 ft./min. are obtainable. These speeds are available by the operation of a control valve situated on a platform opposite the loading chute. This control valve also shuts off the supply of oil to the motor. The final drive of the head sprockets of the creeper is through a triple-reduction totally enclosed gearbox and a pair of spur gears.

Control of the creeper and retarder is by one foot-operated valve. When the valve pedal is depressed, the retarder is energized to open and the creeper automatically feeds the cars forward. On releasing the foot pedal, the retarder is de-energized to hold the cars and the creeper is automatically cut out.

The hydraulically operated tub retarder grips the mine-car wheels on both sides between hinged brake bars fitted with renewable wearing strips. Each set of brake bars is connected to links pivoted to brackets fixed to the main frame of the unit allowing independent motion to compensate for inconsistent wheel profiles. Suspended from the lower end of each link and fitted beneath the brake is a spring-loaded hydraulic cylinder. The brakes are brought to bear on the mine-car wheels by the application of spring pressure and are released by hydraulic pressure.

There are two brake bars on each rail and side thrust on the wheel is eliminated. If there is any failure of the hydraulic system, the retarder is automatically locked.

The retarder is 20 ft. long, sufficient to hold three mine cars.

The operation of the loading point is shown in Fig. 4. Trains of 60 mine cars are hauled from the pit bottom and on reaching the loading point are pushed into the mule-controlled shunt along the side of the conveyor belt. The locomotive retreats to the points where the driver operates the mule starting valve. The mule rises up the ramp to rail level and engages with the dummy axle of the first mine car and pushes the train of empties towards the loading point. Under normal operation the mine cars move at a speed of 80 ft./min., but as loading proceeds the mule pushes the empty cars against the loaded ones and the oil pressure in the circuit increases. The increased pressure operates the pump unloading valve which brings into operation the secondary 2-gal./min. pump.

FIG. 5.—ARRANGEMENT OF CHUTES AT THE LOADING POINT.

This low feed is sufficient to maintain a thrust on the train of cars to ensure a continual feed under the loading hopper. As each car is loaded, the hydraulic retarder is released,

the spotting creeper moves forward, and the pressure in the mule circuit is lowered; thus the empty cars move forward and remain buffered.

The operation of the mule is entirely automatic once it is set in motion by the locomotive driver. Controls and signals are fitted, so that when the last mine car crosses into the fulls track clearance is given for the entry of the next train of mine cars into the shunt. Until this clearance is given a red light indicates to the locomotive driver that he should not enter the shunt. In addition to the coupled signals, the last mine car, on leaving the shunt for the loaded track, resets a valve, which ensures that the mule returns automatically to the inbye end of the shunt in readiness for the next train of mine cars.

All the controls for the operation of the loading point are situated on a platform across the width of the roadway and in front of the radial cut-off chute under the boom end of the belt (Fig. 5). The loading point attendent operates the installation by a foot valve, which releases the retarders and automatically starts the spotting creeper. He is also able to select the speed of the creeper to suit the flow of coal on the conveyor belt by the operation of the three-speed hand control valve. A further valve is also fitted to operate the radial cut-off chute.

Spillage from the loading of the mine cars falls into a hopper below rail level and is loaded onto a chain conveyor, which delivers the coal back onto the main 36-in. conveyor.

The round trip from and to the loading point takes approximately 9 min.; shunting operations can be completed in a further 10 min. The 60-car trains haul about 90 tons of coal, so the haulage system is capable of handling 270 ton/hr. The loading point is well able to deal with this rated output. At the end of the year the district is expected to produce between 6,000 and 7,000 ton/week at a face o.m.s. of 17 tons and a district o.m.s. of 9 tons.

Thanks are expressed to Mr. T. Hulme, general manager, No. 3 (West Lancashire) Area, for permission to visit the colliery and to publish this article, and to Richard Sutcliffe, Limited, for its help in furnishing technical details.

"Workmen at Quarries"

THE Ministry of Power announces that Book 7, "Workmen at Quarries," has been revised; copies are available from the Stationery Office, price 4d. (by post, 6½d.). The Minister, therefore, in accordance with Section 137 of the Mines and Quarries Act, 1954, proposes to designate this book as from January 1.

After that date it will be the duty of the owner of every quarry:—(*a*) To give (unless he has previously done so) a copy of the book to every person on any occasion on which he begins to be employed at the quarry as a person of that class; (*b*) to give, as soon as it is practicable to do so, a copy of the book to every person who, at January 1, 1962, is employed at the quarry as a person of that class.

The book now includes a supplement for shotfirers and the section on "Blasting" includes the new requirements imposed by "The Quarries (Explosives) Regulations, 1959."

International Coal Preparation Congress

FURTHER details are now available of the fourth International Coal Preparation Congress, to be held at Harrogate (Yorks) from May 28 to June 1, 1962. Organization of the congress is being undertaken jointly by the National Coal Board and the Coal Preparation Plant Association and by an international committee composed of representatives from Belgium, France, Germany, the Netherlands, and the United States.

It is hoped that the congress will have a wide appeal to engineers and scientists engaged in research and in the practice of coal preparation technology and to others working in the industries associated with coal mining and the extraction and treatment of minerals. The official languages during the sessions will be English, French, and German, and simultaneous interpreting into all three languages will be provided.

Thirty-five papers, dealing with new or recent unpublished work, will be read at the congress; they will be under seven main headings—relationships between feed composition, plant design, and product quality; automation and control, preparation of small material; flotation and preparation of fine material; determination of washability and separation efficiency; moisture reduction; trends and developments.

The study and discussion of papers will be supplemented by visits to collieries and coal preparation plants; one and a half days have been set aside for this purpose and delegates can choose two plants from an impressive list. For delegates who may wish to stay in Great Britain during the week following the congress, arrangements have been made to enable them to visit other coal preparation plants.

The congress will be opened by Lord Robens, chairman of the NCB. Copies of the preliminary programme and registration forms are now available from Mr. E. D. Wakefield, secretary to the international organizing committee, c/o National Coal Board, Hobart House, Grosvenor Place, London, S.W.1.

Computers for Production Control

For the past two years a sub-committee of the Institution of Production Engineers' Research and Technical Committee has been investigating the possibilities of applying computers for production control applications in the manufacturing industries. A report of this investigation is now published under the title "Computers and Production Control." It includes a description of the various types of computer, a definition of production control and how it may be applied, the use of computers in production control, the economic assessment of a computer system, the conclusion reached by the sub-committee, and illustrative case studies. Copies of the report (price 7s. 6d.) may be obtained from the Publications Department, Institution of Production Engineers, 10, Chesterfield Street, London, W.1.

Iron and Steel Institute

AUTUMN GENERAL MEETING IN LONDON

Some 50 technical papers covering the future of ironmaking in the blast furnace, the energy balance in an integrated steelworks, thermodynamics of slags, oxidation and scaling of steel, bainite, and the effect of steelmaking practices on the mechanical properties of alloy steel drew large audiences to the autumn general meeting of the Iron and Steel Institute, held in London on November 29 and 30 and December 1. Our Metallurgical Editor reports on the meeting.

MEMBERS and their guests, including many from abroad, were welcomed by the president, Sir Charles Goodeve. Business of the formal session which preceded the technical sessions included the nomination of Mr. Maurice Fiennes, chairman and managing director of Davy-Ashmore, Limited, for election as president, to take office at the 1962 annual general meeting and to serve for one year.

SYMPOSIUM ON "FUTURE OF IRONMAKING"

The technical sessions related to almost the whole technology of iron and steel, but these notes will be confined to the symposium on the "Future of Ironmaking in the Blast Furnace." This should not be taken to imply, however, that the subjects presented at other sessions were not of equal importance.

Fuel Injection

Recent years have witnessed a rapid increase in the number of successful applications of fuel injection at the blast-furnace tuyeres, so that it was no surprise to find a full attendance at the Iron and Steel Institute's meeting on the subject.

Six papers were presented in the first session, dealing with both theory and practice of fuel injection. Of the four theoretical papers, three were mainly concerned with establishing methods of calculating the influence of fuel injection on blast-furnace performance and the other reported information and encouraging research results on the experimental blast furnace at the Bureau of Mines, US Department of the Interior.

J. M. Ridgion introduced his approach to the calculation of blast-furnace performance with fuel injection by an examination of the conditions to be satisfied by any method of calculating blast-furnace fuel rates. There followed a critical analysis of methods of calculation of other workers in the light of the conditions set out which related to:—(1) Materials balance; (2) overall heat balance; (3) flame temperature; (4) heat balance by stages; (5) reduction reactions, and (6) productivity and gas flow.

Detailing his method of calculation Mr. Ridgion showed this only required a compromise with regard to the chemistry of ore reduction under conditions of fuel injection at the tuyeres. This difficulty had been made less serious by the use of relationships between top gas CO/CO_2, and percentage hydrogen utilization, and between hydrogen input temperature compensation and percentage change in CO utilization which Wild had derived from a survey of available information on injection of steam, natural gas, and oil in blast furnaces (see "Simple Method of Calculating the Change in Furnace Performance when Fuel or Steam Injection is Practised," by Dr. R. Wild, IRON AND COAL, November 10, 1961).

Using Dr. Wild's method of calculation Mr. Ridgion gave examples of the effects of injecting fuel oil, coal, anthracite, steam natural gas, and coke-oven gas in the blast furnace. When injecting fuel and operating with 100 deg. C. increase in blast temperature, but without oxygen enrichment, the coke saving would range from 0.3 cwt./ton (using steam) to 1.8 cwt./ton (using anthracite) and the productivity increases would range from 2½ per cent. to about 5 per cent. When using an oxygen-enriched blast greater coke savings and productivity can be obtained without increasing the blast temperature. Of special interest is the fact that the gains calculated for the injection of anthracite or coal compare favourably with those for injection of other fuels.

The other theoretical papers in which coal injection is considered also conclude that the economics of coal injection is as good or better than those of fuel oil, and, furthermore, the results of the trials on the experimental blast furnace at the Bureau of Mines strongly support this.

Mr. A. H. A. Wynn, member for science, National Coal Board, spoke of the blast-furnace coal injection trial promoted by the board to be undertaken in co-operation with the Stanton Ironworks Company, Limited. The equipment would be of American design, the same, in fact, as that which was already working satisfactorily in America. It would enable the milled coal to be injected at 12 tuyeres, and pneumatic handling of

the coal supply should be possible throughout. With regard to a technique of putting coal in oil and injecting them together, he said this was being considered.

On this subject, Mr. Catlow (Richard Thomas & Baldwins, Limited) later reported that his company had tried injecting fuel oil and coal together and found no difficulty; work on the injection of fuel and lime and fuel and flue dust was now being undertaken.

In further discussion of the theoretical papers there was criticism of the assumptions made, and it was pointed out that there was often appreciable disagreement between the theoretical and actual results. Nevertheless, the practical blast-furnace operator was anxious to know the potential benefits of a proposed change in operating practice and it must be conceded that although the methods of calculations were not perfect—and, of course, none of the propounders of the methods claimed perfection—the estimates which they gave were a useful guide to those about to undertake fuel injection. The discussion revealed that apart from the oil injection trials at the works of the Steel Company of Wales, Limited, and Richard Thomas & Baldwins, Limited, the results of which had been published, trials of oil injection had been started at the Bilston works of Stewarts and Lloyds, Limited, and Dorman Long (Steel), Limited. Also, trials were to be started shortly in Scotland on one of Colvilles's blast furnaces.

The practical papers described the successful application of the method of injection used and detailed the results obtained. The Steel Company of Wales had used simple injection equipment costing £30,000, and the results had indicated a saving of 5s. to 7s. 6d. per ton of iron.

Hot-blast Stoves

In the second session the discussion of six papers on hot-blast stoves, the importance of which has been accentuated by fuel injection practice, must inevitably have helped to clarify blast-furnace operators' and stove manufacturers' thoughts on methods of obtaining higher blast temperatures.

The lack of heat transfer and pressure drop coefficients were serious obstacles to a fundamental approach to stove checker design and BISRA was to undertake work to fill this gap in basic knowledge. Meanwhile, there were a number of practical approaches that would lead to appreciable increases in blast temperatures. These were the use of:—(1) Higher fuel input rates; (2) better refractories and possibly different checker shapes; (3) short cycles. These changes could be made relatively quickly.

Burden Preparation

The six papers at the third session all stressed the need for burden preparation and recognized that this would take different forms according to the characteristics of the ores concerned. The merits of sinter and pellets were compared, the paper by T. F. Olt showing the remarkable ironmaking rates achieved by the Armco Steel Corporation when using iron-ore pellets. The corporation's 28-ft. hearth furnace at Middleton, using a metallic burden of 85 per cent. pellets and operating at a wind rate of 123,000 cu. ft./min. and top pressure of 7.2 lb./sq. in., had achieved the remarkable output of 2,942 ton/day with a coke rate of 1,304 lb./ton, this being without any fuel injection.

Among the many important points made at this session were that sinter size, or, more especially, the absence of sinter fines, has a remarkable influence on the production rate of the furnace and, secondly, that considerable increases in output are obtainable from full burden preparation, alone, that is, quite apart from fuel injection.

Furnace Engineering

The final session consisted of three papers of a very practical nature. A. Bridge, who recently retired from the position of ironworks engineer, Appleby-Frodingham Steel Company, presented an unusually interesting account of the engineering aspects of ironmaking and furnace design at Appleby-Frodingham. He made some forthright recommendations on the future of blast furnaces for integrated plants. He declared, for instance, that new furnaces should be built to 30 ft. dia. with provision for enlargement to 35 ft. dia. and that "free standing top" construction should be used, *i.e.*, superstructure and charging gear, etc., should be independently supported.

The second paper of this session highlighted blast furnace engineering developments from the British point of view and indicated the direction of future progress. The final paper, which dealt with blast-furnace refractories, reported the good progress made in the selective application of refractories for lining various parts of the blast furnace to meet the more severe conditions now arising and described spiral brick setting of stack refractories to give faster relines.

The overall impression gained was that ironmaking in the blast furnace, having undergone one technical revolution since the war, is now embarked on another. The first, the use of sinter, resulted in a phenomenal reduction in the coke requirements per ton of iron and increase in the production rate, and the second, the injection of fuel at the tuyeres, will result in still further substantial gains on these counts. There are strong indications that this country will be able to use its abundant coal in this way.

Nuclear-powered Submarines

Fourth of the series of special winter lectures arranged by the Institution of Plant Engineers will be on January 16, when Lt.-Cmndr. K. Wilson, repair and engineer officer of the US submarine Proteus, will give a lecture on "The Development and Operation of Nuclear-powered Submarines." The lecture, which will be illustrated by a sound film and lantern slides, will be at the Institution of Marine Engineers, 76, Mark Lane, London, E.C.3, at 7 p.m. Admission tickets may be obtained from the secretary of the IPE, 2, Grosvenor Gardens, London, S.W.1.

Gas Emission

from Coke-oven Chamber Charging Ports

DETAILS of a simple method of assisting in the reduction of gas emission from coke-oven chamber charging ports during the final stages of charging coal into an oven are communicated by Mr. W. Eland, coke ovens manager, Ebbw Vale.

The method installed at the Ebbw Vale coking plant is a mild-steel strap 1 in. by ¼ in. by 2 ft. 11¾ in. long, bolted at the lower end to the charger pan telescopic sleeve operating a foot pedal lever arm. The top of the steel strap has a pawl notch cut in to allow the notch to engage in position below the flange between the charger pan and the discharge gate housing when the pedal arm is depressed, thus holding the telescopic sleeve in the up position.

The procedure for operating the straps is outlined opposite.

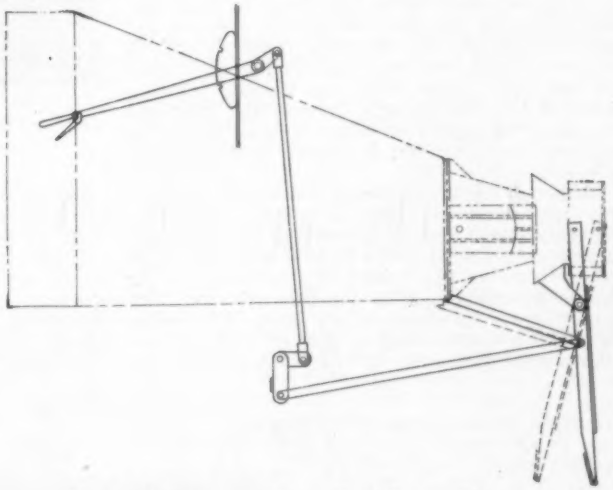
Immediately the coal has completely emptied from the charger pans the operator depresses the pedal arm, allowing the strap, situated at slight angle and resting on the pan flange, to recede downwards to allow the pawl notch to engage below the pan flange holding the telescopic sleeve in the up position.

This permits the operator to push the chargehole lids into position below the telescopic sleeve.

As the No. 1 pan is normally emptied first, this means that gas emission is occurring for the time taken to empty the three remaining pans and the charger car to move away to enable the operator to replace the chargehole lids. By using the described method, a substantial improvement is effected in the gas emission reduction.

Having the lids in position by the time the charger car moves away, the charging operator will have any coal spillage swept on to the lids for depositing in the oven by the time the leveller bar is going into ambush and the oven chuck door is in place. The charging operation will be completed with little or no delay.

The charger machines at Ebbw Vale are of Wellman Smith Owen design, one portal and one normal chassis construction. With a little practice the operators find no difficulty in operating this method. To release the straps merely needs a flick with the chargehole lid hook or brush handle.



METHOD INSTALLED AT EBBW VALE COKING PLANT.

NEW SPOT-WELDING ELECTRODES

INTRODUCTION of a new series of five spot-welding electrodes produced from ½-in. dia. bar with ½-in. tapers to BS 807 is announced by Johnson, Matthey & Company, Limited, 73-83, Hatton Garden, London, E.C.1. These electrodes, it is stated, give better access in confined spaces and cost less than types made from ½-in. bar. High-conductivity Mallory 3 alloy is used for the electrodes. The tapers are accurately machined, and the recommended tip diameter and rake angle are provided. In accordance with the specification, the omission of spanner flats permits a larger diameter hole for cooling water.

The new series and also Mallory ½-in. electrodes machined from ½-in. rod are described in a new catalogue sheet.

NEW FINANCE for the modernizing and enlarging of existing steel plants is to be raised by Italsider, the large steel group of Genoa.

Safety Bridge for Shaft Insets

TRANSFERRING men from cages in mine shafts to infrequently used insets, and from insets into cages, has for many years been considered a hazardous undertaking. The toll of accidents from such operations indicates the need for a safe method of bridging the gap between the cage and the inset, and to eliminate this danger, Mining & Industrial Equipment, Sandal, Wakefield, has designed a patent safety bridge and landing.

The construction of the safety bridge and landing, shown in Fig. 1, comprises a main frame with a mild-steel bottom plate and angle-braced side plates, the whole being of ample width to allow the passage of tubs or mine cars. The frame serving as an inset landing is secured by two girders arranged across the mouth of the inset. Fitted to the bottom plate of the main frame is a mild-steel chequered plate which bridges the gap between the mouth of the inset and the cage. The bridge plate is hinged to the landing steelwork and rollers are fitted to the shaft end of the plate which engage in the holes arranged in the deck plate of the cage. Thus, when the landing bridge is lowered to cover the gap between the inset and the cage, the cage is anchored horizontally during decking operations, yet is allowed limited vertical movement.

Although the bridge locates the cage in position, the support for the bridge is entirely independent from the cage. Support is provided by a T-shaped bridge stop, welded to the underside of the bridge which prevents the downward movement of the bridge by engaging with the forward supporting girder across the mouth of the inset. The bridge is made in two sections to provide a safety precaution in the event of the bridge being inadvertently left in the extended position and fouling the movement of the cage in the shaft. The narrow outer section, forming the automatic emergency self-clearing flap, is secured in the normal operating position by spring-loaded plungers attached to the major portion of the bridge. The flap is able to carry all expected loads with a large factor of safety.

If the bridge is left projecting in the shaft, a descending cage would strike the end of the self-clearing flap, releasing the spring-loaded plungers, allowing it to hang on its hinges in such a position that the normal operation of the shaft is uninterrupted. The safety flap can be quickly restored to its normal operation position from within the landing. If the projecting bridge is struck by an ascending cage, the complete bridge swings upwards, allowing the cage to pass without damaging the bridge.

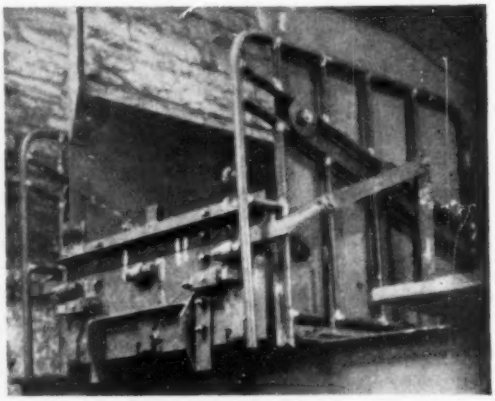


FIG. 2.—THE SAFETY BRIDGE IN THE CLOSE POSITION FOR NORMAL SHAFT OPERATION.

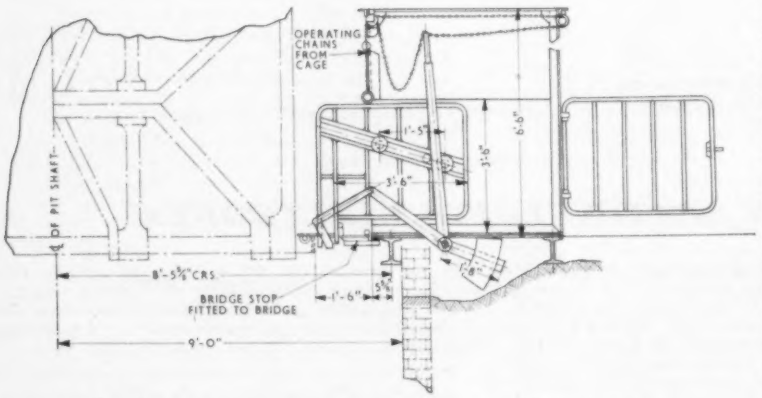


FIG. 1.—SECTION SHOWING THE CONSTRUCTION OF THE SAFETY BRIDGE AND LANDING.

The operation of the bridge is controlled by one lever at the side of the main framework of the landing. The lever is mounted at the end of a 2-in. dia. shaft, which rotates in ball-bearing journals and operates the landing bridge through a series of levers. Balance weights on each side of the landing enable the operator to handle the equipment with maximum ease. All bearings are grease packed and the major moving parts are fitted with grease nipples for lubrication.

Side gates, constructed from 1-in. dia. tube, are also fitted to the landing which retract and extend with the operation of the landing bridge, giving full protection to the side spaces between the landing and the cage. The side gates are suspended by two rollers to facilitate their movement. When it is required to operate the safety bridge from within the cage to gain access to an unattended inset, lightweight chains are fitted which operate the hand levers and which can be easily reached from within the cage. A gate, also made from 1-in. dia. tube, is fitted to the inbye side of the landing to prevent accidental access to the shaft side.

Although the basic equipment for each inset is standard, variation of shaft sizes and proposed sites generally make it essential that each landing bridge is made specifically for each installation. Any shaft size can be accommodated and, where landing bridges have been installed, warning lights have been fitted, so that when the bridge is extended into the shaft, the winding engineman is aware of its operation.

Already a number of safety bridges are in use in several divisions of the National Coal Board. They have also proved useful in facilitating the loading and unloading of materials at surface landings below the normal decking level. At insets, where access is required from both sides of the shaft, the landing can be interlocked by a linkage across the shaft so that gates operate simultaneously. The equipment complies with NCB requirements for inset landings where keps are not required by the Coal Mines Act, 1954.

New Hydraulic Excavator

INTRODUCED by J. C. Bamford (Excavators), Limited, Lakeside, Rocester (Staffs), is a new hydraulic excavator, known as the JCB3. Salient features of this new machine, shown in Fig. 1, include an integral frame and a low centre of gravity, a side offset kingpost to facilitate close quarter trenching, hydraulic stabilizers which enable vertical excavations to be made on ground sloping at up to 10 deg. from the horizontal, two-lever control of all digging operations, and single lever control of loading operations. The excavator is capable of exerting a tearout force of 11,600 lb., has an optimum cycle time of under 10 sec., and a ground clearance cycle time of 23 sec. Its rams are standardized into two basic sizes and the comfort of the operator is provided by an all-weather cab.

The JCB3 is powered by a Fordson Super Major diesel engine which develops 57 b.h.p. at 1,800 r.p.m., this being the same power unit used for the larger JCB4, with which the JCB3 is complementary. Hydraulic power to operate both end equipment and stabilizers is derived from this unit through a Silentbloc flexible cushion drive to a Vickers 21-gal./min., intra-vane type pump which maintains a system pressure of 1,750 lb./sq. in.

The digging rams have been standardized at $3\frac{5}{8}$ in. bore, 29 in. stroke, and 2-in. dia. shafts, and only one set of seals need to be held for field servicing. The stabilizer rams are $2\frac{1}{4}$ in. bore with $1\frac{1}{2}$-in. dia. shafts. All rams are microfinished and the pistons are cylindrically ground to a tolerance of 3 micro in., followed by surface chroming.

Two Hamworthy valves operate the digging and loading hydraulic system. One valve controls the digging operations by two multiposition levers, two further levers on this block controlling the raising or lowering of the stabilizers. Radio frequency induction hardened pins and bushes are used for all pivots and ram fixings, and filtration of the oil in the 30-gal. system is carried out by a filter with an effective area of 4,800 sq. in.

The operator's seat is carried on a pivoted, cantilevered arm such that the same seat is used for road travel and both digging and loading operations. The seat is positioned inside the cab and not astride the kingpost, this being a feature of especial importance when digging alongside walls, scaffolding, etc. The cab windows give full vision in all directions and a hinged rear section of the cab can be lowered in inclement weather for further protection.

In operation, the maximum digging depth with long arm is 13 ft., the standard reach being 13 ft. 7 in. The slewing and digging arc is 200 deg. and the loading height is 9 ft. 4 in. when operating as a back acter and 10 ft. 9 in. when operating as a face shovel. The maximum dump height of the front-end loader is 9 ft. 4 in., the maximum lifting capacity being 4,600 lb.

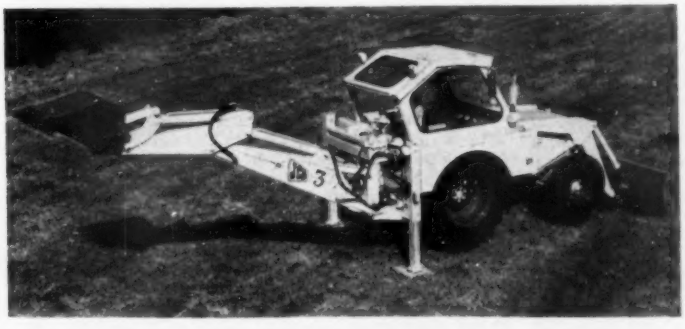


FIG. 1.—THE JCB3 HYDRAULIC EXCAVATOR.

NEW LITERATURE

SOME of the house magazines, catalogues, brochures, and other publications received are referred to below. Readers wishing to obtain a copy of any of the items should write to the address given, at the same time mentioning this journal.

ZINC DEVELOPMENT ASSOCIATION, 34, Berkeley Square, London, W.1—Many articles dealing with the problem of corrosion are contained in the November issue of ZDA Abstracts.

FOSECO, LIMITED, Drayton Manor, Tamworth (Staffs)—Short articles on "Gas Holes in Grey Iron Castings," "New Life for Worn Ladles," "Diecasting Defect," and "Exothermic Padding" are included in the October issue of Foseco Foundry Practice.

FEDERATION OF BRITISH INDUSTRIES, 21, Tothill Street, London, S.W.1—The value of both direct exports and oversea manufacturing to a British company is analyzed by John Oldham, chairman of Oldham & Sons, Limited, in "Exports and Manufacturing Abroad," an article in the December number of the FBI Review (2s. 6d.).

DAVID BROWN TRACTORS, LIMITED, Meltham, Huddersfield—With the introduction of the 990 Autodrive tractor, David Brown becomes the first tractor manufacturer in the world to fit automatic transmission to a production tractor. This is among the news of the month recorded in the December edition of David Brown Tractor News.

EDGAR ALLEN & COMPANY, LIMITED, Imperial Steel Works, Sheffield 9—Peter A. Hayward writes on "The Law of Trade Marks" in the December number of Edgar Allen News (available on annual subscription). There are several other short articles, in addition to various technical contributions continued from previous issues of the magazine.

NATIONAL COAL BOARD, Hobart House, Grosvenor Place, London, S.W.1—The December edition of Coal News (3d.) gives the usual round-up of coalfield news in its nine editions, together with interesting articles and features. Designed to appeal to the mineworker and all others engaged in the industry, Coal News has made good progress in its first six months.

RENOLD CHAINS, LIMITED, Renold House, Wythenshawe, Manchester—"Over 1,000 Products by Renold" is the title of a useful brochure illustrating just some of the products from the complete range of "the world's largest manufacturer of precision chains." More comprehensive catalogues are available, but the new publication will be found very helpful.

W. C. HOLMES & COMPANY, LIMITED, Gas Cleaning Division, P.O. Box B7, Turnbridge, Huddersfield—Publication No. 89 is a comprehensive brochure on Holmes liquefied petroleum gas plant. Since January, 1952, when the company commissioned the first butane/air plant to be installed in the UK, it has designed and installed well over 100 liquefied petroleum gas plants for a wide variety of applications.

TOKYO FOREIGN SERVICE, Central P.O. Box 1157, Tokyo—Far East Iron and Steel Trade Reports is published monthly by this organization. The September issue carries a number of short articles on the Japanese iron and steel and allied industries, together with a survey of the Soviet commercial and industrial trade fair held in Tokyo from August 15 to September 2. There are also several pages of statistical information—Japanese iron and steel production, shipments, imports, etc.

INTERNATIONAL NICKEL COMPANY (MOND), LIMITED, Publicity Department, 20, Albert Embankment, London, S.E.1—"An Introduction to Low Alloy Constructional Steels" is intended primarily for students. It provides data concerning the influence of chemical composition on mechanical properties of low alloy constructional steels and shows how mechanical properties are affected by the micro-structure of steel. The text gives indications of the important role played by various alloying elements which have to be considered when selecting steel to give particular properties.

PYRENE COMPANY, LIMITED, Metal Finishing Division, Great West Road, Brentford (Middx)—The "Pyroclean" range of industrial metal cleaners is the subject of a four-page brochure. The cleaners cover alkali, emulsion, and soak-type degreasing materials for both ferrous and non-ferrous metals. Also available is sales information bulletin No. 8, which deals with "Cuprobond," a non-electrolytic copper coating process. It is an advanced chemical coppering solution and is normally used for the deposition of metallic copper on iron or steel prior to cold working.

CRAVEN BROS. (MANCHESTER), LIMITED, Vauxhall Works, Reddish, Stockport—John Bertram & Sons, Company, Limited, Dundas, Ontario, was founded 100 years ago and is now the largest machine-tool manufacturing plant in Canada, both in point of size and in the variety and capacity of the machine tools produced. Craven Bros. has now entered into an agreement with that company under which the Manchester organization will supply designs and specifications and lend technical assistance to the Canadian undertaking. Details are given in the November-December issue of the Craven Machine Tool Gazette, which also contains a number of articles on the company's plant.

J. BROCKHOUSE & COMPANY, LIMITED, Victoria Works, Hill Top, West Bromwich (Staffs)—This year the company is celebrating "75 years of service to industry," and the report and balance-sheet for the year ended September 30, 1961, includes several pages devoted to the activities of the company past and present. It is of interest to note that the head office and main works are still on the original site at Hill Top. Expansion has been substantial and varied down the years, however; and from the small beginnings of 1886, when nine men were engaged in the making of laminated springs for horse-drawn vehicles, a large and complex engineering group has developed with over 6,000 employees.

MASTABAR MINING EQUIPMENT COMPANY, LIMITED, Church Bank Works, Church (Lancs)—Featured in the December issue of the Comet Journal is the "Pathfinder," the company's new hydraulic roof support. Other articles include "Comet Can Carry It!" ("bricks by the million; bricks and to spare for hundreds of houses; bricks for factories, schools—shops; bricks for building a brighter and better Britain; brick after brick after brick . . . baked in Bedfordshire in the kilns of the Marston Valley Brick Company") and "Deep Navigation Fit Our Fasteners" ("the continuous handling capacity of endless conveyor belts is playing a vital part in the minimum manhandling of the output from Deep Navigation;

making these belts endless—speedily, securely, is the task of the Comet belt lacing system, stouthearted safeguard against joint failures").

CONSETT IRON COMPANY, LIMITED, Consett (Co. Durham)—This company's house magazine is an attractive 24-page publication. The November issue includes a further article on the foundry, a feature on the market town of Hexham (known affectionately for decades as the "Heart of All England"), some notes on the construction work (which is "proceeding apace") and the new steel plant site, and an article about James McKenna. Mr. McKenna began work at Derwent Colliery at the age of 14. He was transferred to the blast furnaces, then had a short spell in America, before returning to work at Consett. Came the General Strike, however, and with it Mr. McKenna's decision to recross the Atlantic, where, for 35 years or so, he was a crane driver with the Heppenstall Company. Now he lives in retirement at Chester-le-Street and has satisfied a long cherished wish to re-visit the Consett works. Mr. McKenna found there had been changes there!

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, 33, Grosvenor Place, London, S.W.1—The aerial ropeway, subject of an article in the December number of AEI Engineering, serves an important role in industry. After a general introduction to the subject, in which the authors, J. D. Kill and D. R. Johns, outline the advantages of aerial ropeway transport over the more conventional methods, such as railways, roads, and conveyor belts, an aerial ropeway at Corby is described in detail. This ropeway, a mono-cable ropeway incorporating a Ward Leonard drive and typical of modern industrial ropeway practice, was supplied to Stewarts and Lloyds Minerals, Limited, by the British Ropeway Engineering Company, Limited (now Ropeway & Conveyor Services, Limited). It runs between Rothwell and the outskirts of Corby, a distance of five miles, and is believed to be the longest in this country. The electrical equipment was supplied by BTH, now Associated Electrical Industries (Rugby), Limited, and the ropeway is used for transporting iron ore from a quarry to the rail head at the ropeway drive end. The ore is then sent by rail to the furnaces at Corby.

BRITISH IRON AND STEEL FEDERATION, Steel House, Tothill Street, Westminster, London, S.W.1—"The fact is that people don't really appreciate what safety means till they've had an accident," says David Watkins, a 19-year-old worker at the Abbey Works of the Steel Company of Wales, Limited. David was one of six young men from various steelworks invited up to London to air their personal views on accident prevention in the industry. The invitation came from Safety, the magazine of accident prevention and industrial health published by the federation's Accident Prevention Committee, and some of the views of the youngsters are reported by Geoffrey Goodman, the Daily Herald's industrial correspondent, in the latest issue (No. 15) of the magazine. They had some interesting and useful comments to make. In "Safety in a New Works" H. F. Spencer, managing director of Richard Thomas & Baldwins, Limited, outlines the proposed safety policy of the company's new Spencer Works, while David Knight illustrates some of the features incorporated at the design stage. This week, more than 300 delegates from companies throughout the British iron and steel industry met in Harrogate for the Accident Prevention Committee's second safety conference. The chairman, F. B. George, said: "There is no shortage of ideas for encouraging safety and this conference provides a chance for us to pool our ideas." A copy of his speech is enclosed in the magazine.

CANADA TO RESUME TUNGSTEN PRODUCTION

CANADA has produced no tungsten since July, 1958, when Canadian Exploration, Limited, closed its tungsten operations at Salmo, British Columbia. The operations were terminated on completion of a sales contract with the United States General Services Administration. Canada Tungsten Mining Corporation, Limited, continued exploration and development work on its property near 61° 57′ N. and 128° 16′ W., which is just east of the Yukon-North-west Territories boundary and 135 miles north of Watson Lake. Diamond-drilling indicated a tungsten deposit of 1,500,000 tons grading 2.4 per cent. tungsten trioxide (WO_3), and beneficiation tests showed that a commercially acceptable scheelite ($CaWO_4$) concentrate could be obtained from the ore.

Under an arrangement announced by Canada Tungsten Mining Corporation early in 1961, American Metal Climax Inc., Dome Mines, Limited, and Ventures, Limited, were to finance the property and bring it into production. Also, the Department of Northern Affairs and National Resources agreed to build an 80-mile development road from Ross river to the Hyland river valley, and to contribute two thirds of the cost of a 50-mile access road from the valley to the mine site.

It is expected that the roads will be completed in 1963 and that shipments of concentrate will thereupon begin.

Scheelite is found in association with gold-quartz veins at many active and long-dormant gold mines in Nova Scotia, Quebec, Ontario, Manitoba, British Columbia, and the North-west Territories. At present these occurrences are not of economic significance. Wolframite has been found in stream gravels and in quartz veins in the Atlin area of northern British Columbia and Yukon Territory.

Forthcoming Events

DECEMBER 18

Institution of Mechanical Engineers (Education and Training Group):—Meeting at 1, Birdcage Walk, London, S.W.1, at 6 p.m. Discussion on "The Teaching of Machine-tool Technology as an Academic Subject."

DECEMBER 19

Institution of Mechanical Engineers (Eastern Branch):—Annual dinner and visit of the president, Sir Kenneth Hague, at King's College, Cambridge.

DECEMBER 20

Institute of Welding (West of Scotland Branch):—Meeting at the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7 p.m. "Welding of Pipe Installations for Power Stations," by J. Hammill.

Society of Chemical Industry (Corrosion Group):—Meeting at 14, Belgrave Square, London, S.W.1, at 6 p.m. Discussion of recently published papers.

Institution of Plant Engineers (Kent Branch):—Meeting at the South-Eastern Gas Board Lecture Hall, 95, High Street, Rochester, at 7 p.m. "Molybdenum Disulphide as a Lubricant," by D. E. Burton.

DECEMBER 21

Institution of Plant Engineers (Blackburn Branch):—Meeting at the Castle Hotel, Blackburn, at 7.30 p.m. "The Merits of Various Heat Generation and Distribution Systems," by R. A. Wiggans.

National Association of Colliery Managers

DECEMBER 19

Yorkshire Branch:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. "Visit to Germany," by E. R. Wastell.

Industrial Output Fall in September

THERE was a sharp fall in industrial output in September, the official adjusted index of production for all industries being provisionally estimated at 122 (1954=100). This is two points below August and three points below the peak of 125 reached in July, when the Chancellor introduced his restrictive measures. The "all industries" index includes mining and building as well as manufacturing. The adjusted index for manufacturing alone has dropped from 127 in July and 125 in August to 123 in September. Compared with September a year ago, industrial output as a whole has risen less than 1 per cent., and manufacturing output not at all.

Unemployment continued to rise between October and November. At mid-November, 387,339 people were registered as unemployed in the UK, which was 21,594 more than on October 16. The November total is the highest since last February, and the greatest for this time of year since 1959.

New orders received by the engineering industry in September were 5 per cent. higher than a year earlier, and the volume of production was 11 per cent. more, the Board of Trade reports. New export orders rose by 4 per cent. against the previous September, and the index of export orders on hand rose to a new peak of 111, compared with 102 a year ago (1958 = 100). Home orders in September were 6 per cent. higher than a year earlier.

Another rise was recorded in the value of the machine-tool industry's order-book during September. At the end of the month orders on hand stood at the record level of just over £118,800,000, compared with £98,900,000 a year earlier. Export orders received in September were £2,715,000—£30,000 in advance of deliveries for export, but somewhat lower than the rate during May to August when export orders were on average more than £1,500,000 in excess of deliveries. Home orders were £7,246,000—6 per cent. less than a year ago, and nearly £20,000 below the rate of deliveries.

Low Cost Automation and the Small Manufacturer

WIDE scope for low-cost automation existed in most types of industries, but senior management had to be convinced of its value and applicability, said Mr. Landon Goodman, industrial specialist of the Electrical Development Association, speaking recently at a meeting of the Kingston Area Productivity Association at the works of K.L.G. Sparking Plugs, Limited, London, S.W.15.

Mr. Landon said that the small manufacturer often argued that he had the disadvantages of short production runs, old equipment, or inadequate buildings, but sometimes failed to realize his advantages over the large manufacturer, such as less rigid product designs, no costly special purpose equipment, and faster and less expensive change-over. A feature of low-cost automation was the use of simple types of equipment which could be used again and again, such as air cylinders, solenoids, valves, timers, and photo-electric cells. Most applications involved the addition of these simple "building blocks" to existing plant and machinery.

Redundancy Schemes Urged for Industry

REDUNDANCY schemes which could be agreed by unions and managements for national use, are urged for industry in a report by the Central Committee of Study Groups. It is suggested that the preparation of a model scheme should be in the hands of a group similar to the ones that prepared the reports, based, that is, on members of the Duke of Edinburgh's study conference.

As features of any scheme, four basic conditions are mentioned. Security of finance, backed perhaps by a guaranteed trust fund; protection for the older worker, who cannot easily find another job; long notice and time off for interviews; and payment during training for other work.

Another report, Work and Leisure, a summary of investigations by several groups, has also been prepared. It declares that if a standard £20 for a 40-hour week was achieved, "it is as sure as fate that many, if not a majority, of workmen would like to add another £5, or more, by setting their sights on a yet higher level of consumption."

New Award for Production Engineers in India

MADE possible by the generosity of Sir Walter Puckey, the Council of the Institution of Production Engineers has established a fund to enable an annual award to the value of £50 to be made for the most significant contribution to production engineering in India. Sir Walter, who is chairman of Management Selection, Limited, and a director of Black & Decker, Limited, and a number of other companies, is a past president of IPE and a well-known production engineer.

Selection of candidates, who must be of Indian nationality but not necessarily members of IPE, will be made from applications or recommendations to the Indian Council. It is hoped that the first award will be made next year.

More Production Records at Appleby-Frodingham

MORE records of ingot and iron production are reported by the Appleby-Frodingham Steel Company, branch of the United Steel Companies, Limited. During the four weeks after the "Q" furnace was converted to the Ajax process the furnace has produced 16,578 tons of ingots. The previous four-weeks' record was 12,907 tons, made in the period ended February 13, 1960.

The Queen Mary blast furnace produced 33,830 tons of iron—the best in its long life—during the four weeks ended November 25. The previous best was 33,770 tons made in the period ended April 9, 1960.

FIRST 15,000 tons of iron ore from Liberia's newly operational mines near the Sierra Leone border were loaded last week on the Cope Franklin, a vessel of the British Iron & Steel Corporation, Limited, for delivery to Liverpool. The mines, the second group in the region to come into operation under the Liberian National Iron Ore Mines Company, Limited, project, are expected to ship about 3,000,000 tons of ore from the new pier at Monrovia in the first year.

COLVILLE PROFITS DOWN

But Fall in Sales and Output was Slight

REPORTING a fall in consolidated profits from £16,170,000 to £13,740,000 in the year ended September 30, 1961, the directors of Colvilles, Limited, state that present indications are that the current level of operations is being maintained, and although lower than last year, it is still profitable. There are, as yet, " no signs of a revival." The net profit for the year, after all charges, including the transfer of £3,000,000 (same) to general capital reserves, was £4,606,319 compared with £4,980,211. The final dividend of 10 per cent. on the increased capital makes an unchanged total for the year of 16 per cent.

Production of pig-iron by the company during the year was a record at 1,041,531 (963,586) tons. Output of steel ingots and castings was 2,041,947 against 2,056,467 tons, and that of coke was 806,379 (698,067) tons.

During the first half-year, it is stated, demand was well maintained but declined noticeably during the second half. However, over the year as a whole the fall in sales and output was slight. The decline in profits was aggravated by increases in costs of fuel, wages, transport charges, and local rates. These increases have been only partially reflected in the selling prices fixed by the Iron and Steel Board.

Progress in the construction of the strip mill development scheme has been satisfactory. The expenditure during the year on all schemes totalled £33,095,091.

Iron-ore Mining in Britain

IN an article in the staff magazine of the United Steel Companies, Limited, Mr. G. D. Elliot, general works manager of the Appleby-Frodingham Steel Company branch, says that iron ore in the group's Midland and eastern reserves is enough to last the group's Scunthorpe steelworks for 80 years at a rate enabling a steel output of 3,500,000 tons a year. This is 1,000,000 tons higher than Scunthorpe's present capacity.

The getting of ores, he says, is rapidly developing in expertise. Not only is underground mining the subject of far-reaching development work, but giant machines are now far extending the scope of open-cast mining. It is now possible to strip economically 150 ft. of cover from the ore bed.

This factor, he says, is of real importance to Scunthorpe. " If the ore is quarried after stripping the overburden, the whole of the usable ore of the bed can be extracted. If the ore has to be mined without subsiding the surface, the yield from underground working will be only about 60 per cent. In other words, the reserves of ore within the district are increased as the depth of cover which can be stripped is increased."

Mr. Elliot says that the year 1961 will be looked upon as the last in which the industry in Scunthorpe attempted to deal with its raw material in the form in which nature laid it down. This is because next year will see ore preparation plants, which will predigest the ore before sending it to the blast furnace, in operation at all three Scunthorpe ironworks.

Two More Steel Groups Report Setback

FALLS in trading profits of about £1,000,000 in 1960-61 are reported by two more large steel manufacturing groups, John Summers & Sons, Limited, and South Durham Steel & Iron Company, Limited. John Summers is repeating the total dividend at 15 per cent., with an unchanged 9 per cent. final, while South Durham Steel & Iron is cutting its final dividend by 2 per cent. to 6 per cent., making a total of 10 (12) per cent.

Group profit of John Summers amounted to £13,175,073 for the year to September 30, 1961, compared with £14,338,221 previously. After charging depreciation of £4,722,966 (£4,574,138) and tax of £4,090,000 (£4,400,000), the net available earnings are down from £4,674,614 to £3,647,855.

Trading profits of South Durham Steel & Iron totalled £7,063,154 for the year to September 30, compared with £8,066,717. Depreciation and interest charges are heavier, and the balance before tax is down by £2,300,000 at £2,121,661. After tax and transferring £900,000 (£2,000,000) to general capital reserve, the net profit balance is £1,021,661, against £2,232,706.

More Export Effort Needed in German Market

STUDY group of senior British industrialists was told by Dr. P. von Schweitzer, a German executive of Sales Audits, Limited, that British sales to Germany were running at the rate of £170,000,000 a year, but if British firms were prepared to make a careful study of the needs of the German customer and make a wholehearted sales effort in Germany this business could be dramatically increased.

Four marketing experts from Germany declared that the German buyer demanded top quality and up-to-date design, first-class company sales service, and competitive prices.

Dr. Rasner, a commercial lawyer with a leading Cologne firm, believed that one answer was for British companies to open subsidiaries in Germany. He pointed out that the formation of a subsidiary was easier in Germany than in almost any other country, as German law permits directorships, shareholding, and management to be held by foreign nationals.

Personal

Retires After 48 Years in Coal Mining

AFTER 48 years' service in the coal-mining industry, Mr. H. KENDALL will retire from the post of deputy Area production manager (planning) of No. 4 (Carlton) Area of the North-Eastern Divisional Coal Board on December 31. He received his early mining engineering training with the Staveley Coal & Iron Company, Limited, and later attended Sheffield University to gain his first-class and Home Office mine surveyor's certificates. In 1925 he became undermanager, and later manager and agent of the Westthorpe, Norwood, and Holbrook collieries in north-east Derbyshire, moving to South Yorkshire in 1943 to become manager of Grimethorpe Colliery.

In 1947 he was appointed agent of Grimethorpe, Ferrymoor, and Brierley collieries, and subsequently group manager. He took up his present post in 1956, and has been responsible for carrying through a heavy Area reconstruction programme. He is a member of the Institution of Mining Engineers, and the Yorkshire branch of the National Association of Colliery Managers.

A presentation has been made to Mr. D. OGILVIE, Fife Area chief surveyor, Scottish Divisional Coal Board, who is taking up an appointment as Area chief surveyor in the Lothians.

Head of the Department of Mechanical Engineering at Sheffield University, Prof. J. P. DUNCAN was on Monday installed as president of the local branch of the Junior Institution of Engineers.

General manager and secretary of the Blyth Harbour Commission since 1938, Mr. G. L. ATKINSON is to retire at the end of the year. He has played a considerable part in promoting the coal trade through the port.

To mark his retirement, Mr. WILLIAM HAZON, undermanager at Ravensworth Ann Colliery, Birtley (Co. Durham) for the past 24 years, was entertained at dinner at Chester-le-Street last weekend. He is a MBE and holds the Carnegie Certificate for his part in rescuing more than 30 miners trapped in a Birtley drift.

Associated with the Staveley Iron & Chemical Company, Limited, for some 50 years, Mr. LESLIE BRELSFORD has retired after having been confidential clerk to six successive foundry general managers of the company since 1924. He joined the staff as office boy in 1907 and was the last of the Brelsford family to serve the firm, following his father and grandfather.

Deputy chairman of the Gas Council, Mr. W. K. HUTCHISON has been elected president of the British Tar Confederation for 1961-62. Vice-chairmen of the executive board will be Mr. C. LORD, chairman of Lancashire Tar Distillers, Limited, and Lt.-Col. P. F. BENTON-JONES, managing director of United Coke & Chemicals Company, Limited, branch of the United Steel Companies, Limited.

Mr. S. W. POTTS, general manager of the No. 2 (Mid-East Durham) Area of the Durham Divisional Coal Board, was installed president of the North of England Institute of Mining and Mechanical Engineers at Newcastle-upon-Tyne, last Saturday. He suceeeds Mr. J. S. Carson, deputy production manager (planning), No. 3 (North Cumberland) Area of the Northern (N&C) Divisional Coal Board.

Managers and Men Need Team Spirit

MEETINGS between management and workmen to promote a better understanding in industry and to help boost productivity, were urged by speakers at a conference organized by the Industrial Association of Wales and Monmouthshire in Cardiff recently. Mr. E. H. Hickery, divisional officer of the Iron and Steel Trades Confederation, said that a climate of manager-worker relationships built up in the steel industry over 60 years was in danger of vanishing in the larger steel plants such as Margam (Glam), and Llanwern (Mon).

He went on to say that the technological revolution in the industry had made managers more remote from each other. The trade union movement could not, with the resources and time at its disposal, break down the mental attitudes of suspicion and fear. Managements must give local union officials the opportunity to learn management techniques. "They could send an equal number of foremen and union officials to the same school, where they could learn to understand one another," he added.

Mr. L. G. Oxford, managing director of Simmonds Aerocessories, Limited, manufacturers of aeronautical and engineering accessories, etc., of Treforest (Glam), said: "If you want the best effort from your team, take them into your confidence, discuss the problems openly and there is no doubt that, by this means alone, efficiency and production will increase." He suggested forming committees, consisting of management and workmen, to discuss problems.

J. H. Fenner Completes Expansion Programme

IN a joint statement, Mr. C. Bradshaw, chairman of J. H. Fenner & Company (Holdings), Limited, and Mr. S. B. Hainsworth, managing director and deputy chairman of the group, which manufactures power transmission equipment, etc., say that apart from the heavy cost of re-equipment, the rehousing, and expansion of production facilities at the three manufacturing divisions, involved some dislocation of production.

None the less overall turnover was 17½ per cent. higher and export sales increased by 9 per cent. The work of reorganization is now almost completed and results for the current year should show the benefit of the work that has been undertaken.

As promised a year ago, some of the staff and employees are to receive a centenary bonus costing about £30,000. Following the annual meeting on January 3, an extra-ordinary meeting will be held to ask for certain changes to be made so that it will be possible to issue certain options to purchase ordinary shares to working executives.

Management Study Grants

FORMED to encourage management studies at university level, the year-old Foundation for Management Education, which held its first annual meeting last Friday, is now committed to the full extent of its resources. Within the next two years further proposals may call for additional finance to the extent of £100,000 a year, says the chairman, Mr. J. W. Platt.

Already the foundation has made grants which have helped the universities of Bristol, Leeds, Cambridge, Manchester, and Durham.

IRON AND STEEL TRADE

AT the best of times there is a run-down in business as the Christmas and New Year holidays approach and the further depreciation in the position now being experienced has added to the intensity of the recession. The outlook has not been made any brighter by the reports of the bigger steelmakers which show a marked fall in profits even though the balance-sheets cover only the beginning of the falling-off in trade. There has been a further drop in sales of heavy sections, joists, and plate, and the industry seems destined to enter 1962 with outputs touching a new low.

Pig-iron

There is little change in the pig-iron situation. In spite of the fact that the number of furnaces in blast has been reduced and many are working at below capacity there are plentiful supplies of all grades of pig-iron. Demand from the steelworks for basic pig-iron is easily met, both for consumption and stock requirements.

Fairly substantial consignments continue to be shipped oversea. The foundries are also well provided, the low phosphorus irons being in biggest demand. From the engineering and speciality foundries some fairly good tonnages of hematite and some refined irons are being called for.

Ferro-alloys

Ferro-tungsten is quiet, but ferro-molybdenum and ferro-vanadium are in fair request. The 75 per cent. Si and 45 per cent. Si grades of ferro-silicon are of moderate interest and calcium silicide is quite active. There is not much demand for ferro-chrome, particularly the low carbon grades, but ferro-manganese and silico-manganese are steadily active.

No improvement is noted in the call on ferro-niobium and ferro-titanium. There is a reasonable demand for chromium metal, but silicon metal is of only slight interest.

Semi-finished Steel

Most of the re-rollers are short of work and the demand for their products is only moderate. Although the majority are working on a reduced number of shifts, difficulty is still experienced in finding sufficient orders for small bars, light sections, strip, etc., to make up rollings.

The call for steel semis is well below the tonnage available from the steelworks. Much larger quantities of mild steel billets could be supplied and the availability of carbon and alloy steels is now much easier.

Finished Steel

Due to the approach of the Christmas holiday, a further fall in demand is reported and the steelworks are having difficulty in maintaining production even at the reduced level of the past few weeks. The plate position remains much the same and the demand is only fair for good commercial quality bright drawn bars, and special alloy and high carbon steels for the engineering trades. Many of the constructional engineers are reasonably well occupied but competition is still very keen for any new business arising.

After 41 years with the Laporte Industries, Limited, group, Mr. VICTOR W. SLATER has retired as a director. He joined Laporte at Luton as a chemist in 1920, and was appointed chief chemist there in 1941. In 1946 he joined the board of the parent company as chemical director, and also served for periods on the boards of Laporte Titanium, Limited, Laporte Acids, Limited, and James Wilkinson & Son, Limited.

Ore Chartering

ONLY a moderate volume of tonnage appears to have been fixed from the major markets and owners are having difficulty in maintaining last rates paid, partly on account of poor demand. Marmagoa/Kokura has now secured a 10,000 tonner for January 15/31 at 46s. 6d. f.i.o. and trimmed, and 9,500 tons 10 per cent. has been fixed to Trieste or Rijeka at 37s. f.i.o.t. for December 15/30, which rate has also been paid to 10,000 tons 5 per cent. to West Italy with Trieste option for December/January loading. Other ore fixtures include Durban or Port Elizabeth/one port Osaka-Kobe Range 12,000 tons 5 per cent. at 37s. f.i.o.t. for January 1/20 and Vitoria/Jugoslavia 9,500 tons 10 per cent. at 47s. 6d. f.i.o. for December/January loading.

Phosphate from Casablanca to the UK is quiet, but a 10,000 tonner has been taken from Tampa to West Coast UK for prompt loading at 52s. 6d. on gross terms, while Casablanca/South China reports 12,000 tons at 61s. and 12,500 tons at 60s. 3d., both for December 5/30 loading. Tonnage of 9,500 tons has been taken to load concentrates from Port Pirie to Bristol Channel option Havre/Hamburg Range at 90s. option two discharging ports in the Bristol Channel at 2s. extra and option of Antwerp direct at 2s. 6d. less for January/February loading, and sulphur from Coatzacoalcos/Immingham and Tees at 58s. 9d. for 13,000-ton vessel for December 1/15, f.o.b. steamer discharging.

North African trading to UK or Continent is very quiet and there appears to be no particular demand for the large vessel, even for Continent discharge.

Less Iron Ore and Scrap Through Tees Ports

TOTAL imports and exports into the River Tees for the year ended October 31, 1961, were just under 7,000,000 tons, a decrease of about 800,000 tons on last year. Imports fell by almost the same amount and totalled 5,500,000 tons, the principal decrease being in iron ore, coal, and scrap.

Exports were slightly up on last year at just over 1,500,000 tons. Figures show that exports of iron and steel and sulphate of ammonia were balanced by increased shipments of slag.

FOR HIS design of a cooling tower in reinforced concrete, Mr. A. R. Burton, of Margate, has been awarded the Charles Hawksley Prize for 1961, which is presented each year by the Institution of Civil Engineers in a competition combining aesthetic merit and sound engineering design. The prize is open to students, graduates, and associate members of the Institution under 30 years of age.

Coalfield News

Welsh Open-cast Plan Approved

BECAUSE outcrop coal must be worked to retain the oversea markets for anthracite and to combat the competition from oil and other methods of heating, Carmarthenshire Planning Committee has authorized open-cast workings at Blaina Deep, Penybanc, near Ammanford. Opponents of the scheme spoke of villagers already suffering from the effects of fumes from old deep mines in the south and of the dangers of subsidence if old workings in the area were disturbed by open-cast operations.

The National Coal Board plans to finish extracting coal from the site in three years. It is a key site in the board's plans and there are stated to be 340,000 tons of good anthracite to be extracted.

CERTIFICATES FOR long service ranging from 42 to 52 years, were received by 17 retired Norton Colliery miners at the ex-miners' annual Christmas party at Tunstall (Staffs), last Saturday.

Miners' National Band Contest

WITH a top prize of 200 guineas and three trophies, including one called the Lord Robens Trophy, the Coal Industry Social Welfare Organization is to sponsor the first Mineworkers' National Brass Band Contest, to be held at Blackpool on October 13, next year. In three sections —championship, second, and third—the contest will be restricted to brass bands associated with the coal industry. Total prize money is over £850.

Rules will be those issued by the National Brass Band Contesting Council of Great Britain, and entry will be by invitation. Bands must have won an equivalent section of an approved contest organized by a CISWO divisional welfare committee or an Area of the National Union of Mineworkers. In the absence of divisional qualification, bands will be placed in the equivalent section of the Daily Herald area contest.

TO MARK HIS recent retirement as unit mechanical engineer at Marley Hill Colliery, and Blackburn Fell Drift (Co. Durham), a presentation has been made to Mr. John Dawson, after 51 years in the industry.

SHIPMENTS OF COAL and coke through the South Wales ports last week totalled 51,669 tons. This was 17,413 tons less than in the previous week, but was within 250 tons of the figure for the corresponding period last year.

RESOLUTION protesting against Scottish coal mine and rail closures was passed unanimously by Lanarkshire County Council last week. The authority supported the miners and railwaymen in their demand for an inquiry into the social and economic aspects of the closures.

TOTAL SERVICE OF NEARLY 1,200 years was represented by 26 miners who received long-service certificates from Mr. Leonard Wright, agent/manager, Welbeck Colliery, and Mr. D. H. Taylor, No. 3 (Edwinstowe) Area industrial relations officer, East Midlands Division of the NCB, last Friday.

REPRESENTATIVES OF 78,000 members of the Midland District Miners Fatal Accident Relief Society decided at Derby on Saturday to double the weekly subscription from 2d. to 4d., and to make substantial increases in the benefits paid to widows and orphans. The increases will date from January 1.

A FEW MINUTES after he had been ordered by an overman to leave a train and walk to the shaft, Mr. Ronald Turnbull (37), a fitter at Westoe Colliery, South Shields, was fatally injured when he fell from the train. The accident took place underground. At the inquest a verdict of Accidental Death was recorded.

DISCUSSIONS HAVE taken place between the colliery management and the National Union of Mineworkers to improve efficiency and productivity at Ashington Colliery (Northumberland). The colliery, it is said, has reserves to last another 70 years, and during the next few years, work will be extended into new seams which will entail longer haulage systems.

PRODUCTION MANAGER for the No. 3 (North Cumberland) Area of the Northern (N&C) Divisional Coal Board, Mr. W. C. Wilkinson, speaking at a dinner for retired colliery mechanics last weekend, said that 1,000,000 tons of stock-piled coal at Ashington has been disposed of during this year. The remaining 300,000 tons would be sold during the next few months.

VOLUNTARY SATURDAY shift miners at seven North Staffordshire pits produced 2,854 tons of coal last week, their best figure so far. There were 940 men on the shift, four more than the previous week. Throughout the West Midlands Division, one extra pit, 26 in all, worked the Saturday shift and aggregate tonnage mined was 13,718 tons, the highest for the voluntary shifts worked so far this winter.

Northumberland NCB Areas to Merge

AS from January 1, 1962, the South and Mid-Northumberland Areas of the Northern (N&C) Division of the National Coal Board will be combined. Discussions have already taken place with the unions concerned. In 1960, No. 1 Area produced approximately 3,000,000 tons and No. 2 Area more than 3,500,000 tons of saleable coal. There will be 29 producing collieries in the new combined Area.

Mr. E. W. Potts, who is at present general manager of No. 1 (South Northumberland) Area, will be general manager of the new Area. Mr. W. J. Charlton, at present general manager of No. 2 (Mid-Northumberland) Area, has, as already announced, been appointed by the NCB to become general manager of No. 7 (Wakefield) Area, North-Eastern Division.

NATIONAL CERTIFICATE IN MINING

IN the 1961 examination for the Ordinary National Certificate in Mining, held by the Institution of Mining Engineers, 726 candidates out of 1,249 who entered gained certificates. In addition, seven candidates received endorsements on certificates already held. Distinctions were gained by 172 students. In the examinations for Higher National Certificates in Mining, 209 out of 296 entrants passed the examination, 27 with distinctions.

Of the 280 candidates who sat for Higher National Certificates in Mining Surveying, 190 passed and 17 received distinctions. In the examinations for the National Diploma in Mining, 108 students were successful out of 122 who sat. Distinctions were gained by 30 students.

THE COAL TRADE

SO far as house coal is concerned there is little or no delay in the execution of orders, even though the stimulus supplied by the recent sharp weather brought an influx of orders. Stocking arrangements, both at the pithead and at depots, appear to be adequate to deal with the demand and if merchants have to dip heavily into stocks, the majority are sufficiently well placed to be able to do so without undue concern. In some areas an improvement is reported in the smokeless fuel situation, but, generally, merchants would like to be able to promise speedier deliveries of anthracite and some other smokeless fuels.

DERBYSHIRE

Last week's cold spell has, in general, produced sufficient orders at merchants' offices to keep them going until the Christmas holiday, but requests for delivery are still coming in. Best and hand-picked coals are in steady demand, with supplies adequate. The better types of screened cobbles and brights attract a fair amount of attention, and, with despatches on a good scale, most inquiries are being handled satisfactorily. Cheaper brights are popular, and supplies are fairly regular against contract. Best large nuts are keenly sought, and all current arrivals find a ready market. Washed medium and small nuts are in good demand, with supplies adequate.

Demand for Gloco and Gloco nuts is fairly good, and, with plentiful stocks, the delivery position is satisfactory. Demand for premium smokeless fuels continues to show a steady increase; Coalite and Rexco are still very slow and insufficient quantities are available to meet the potential demand. Cleanglow and Warmco are more readily obtainable, and turnover of these fuels shows a steady increase. Domestic anthracites show little improvement in availability. Phurnacite is in good demand, but orders have to be booked at the works many weeks in advance of requirements. The small anthracite position remains very tight, and deliveries are frequently on a day-to-day basis.

The situation in the industrial market is typical for the season, with deliveries well maintained against a steady call for supplies. Nutty slacks continue to be readily available in face of an even demand. Dry screened nuts are firmly sought, and forwardings are in keeping with current requirements. Washed fuels are subject to fairly strong pressure, and on the whole deliveries are being satisfactorily maintained; at the same time there is evidence of increasing pressure and delay at certain colliery landsales. Hard steam coals are in steady request, and satisfactory forwardings are reported. A steady inquiry is reported for hard and gas cokes, and deliveries are prompt.

RECORD FOR EAST MIDLANDS NCB AREA

BIGGEST coal-producing Area in Britain, the No. 3 (Edwinstowe) Area of the East Midlands Divisional Coal Board, is now in sight of a record output this year. Last weekend the year's total topped 9,000,000 saleable tons, achieved a week earlier than the previous record period in 1957. With over two production weeks to go, the Area has already beaten the output figure for the whole of last year.

Increased mechanization, and good industrial relations, are the reasons given for the improved performance.

Coal Output Below Consumption

MANPOWER in the coalfields continues to seesaw up and down. Having risen to 561,830 overall and 209,920 at the face, it dropped slightly to 561,790 and 209,820 in the week ended December 2. The bad weather affected open-cast output, otherwise last week's total output would have shown another welcome increase. At 4,116,400 tons it is nearly 100,000 tons below the current rate of consumption.

Stocks, both at the pithead and at depots have been eaten into in the past few weeks and are now down to 22,324,000 tons and 18,000,000 tons, respectively.

There were 561,790 wage-earners on colliery books on December 2, against 584,530 on December 3, 1960, the numbers engaged at the coal face being 209,820 and 220,870 respectively. Output at the face was 4.365 tons and overall 1.527 tons in the week ended December 2, compared with 4.093 and 1.442 tons in the week ended December 3, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended December 9, and the tonnage lost through disputes:—

Division.	Week ended December 9, 1961.		Week ended December 10, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish ..	366,000	5,000	349,000
Northern (N&C) ..	249,000	—	249,000
Durham ..	459,000	—	467,000
North-Eastern ..	887,000	3,000	865,000
North-Western ..	250,000	2,000	261,000
East Midlands ..	975,000	—	912,000
West Midlands ..	314,000	—	291,000
South-Western ..	388,000	5,000	390,000
South-Eastern ..	31,000	—	31,000
Great Britain—			
Deep-mined coal ..	3,919,000	15,000	3,815,000
Open-cast coal ..	153,000	—	143,000
Other deep-mined (including licensed mines) ..	45,000	—	38,000
TOTAL ..	4,117,000	15,000	3,996,000

TO MAKE A wider use of methods of management instruction formulated by the company's research department during the last 14 years, the Glacier Metal Company, Limited, manufacturers of plain bearings, and bearing metals, etc., of Wembley (Middx), has formed the Glacier Institute of Management, which is already holding three-week courses for Glacier's senior management, and, from January 1, is to have members of similar level from other companies at the courses.

Orders Placed

Slag Processing Plant for Spencer Works

CONTRACT for a blast-furnace slag processing plant at the Spencer steelworks of Richard Thomas & Baldwins, Limited, has been awarded to Stothert & Pitt, Limited, by Heckett (R.T.B.), Limited. The plant has been designed to deal with blast-furnace slag at the initial rate of 350 tons an hour, and later to be capable of extension to deal with 700 tons an hour.

Sales of the finished products from the plant will be undertaken by Llanwern Slag Products, Limited, which is associated with Hobbs (Quarries), Limited. Heckett (R.T.B.) is a subsidiary of Marsco Corporation, of Pennsylvania, US.

AN ORDER has been received from the US by Matthew Wylie & Company, Limited, manufacturers of wood box nailing and printing machinery, of Glasgow, for a 140 in. cable reel nailing machine valued at £27,000.

AN ORDER for the supply of three Allen-Stoeckicht epicyclic gears for an axial-flow multi-stage compressor in Tarnow, Poland, has been received by W. H. Allen, Sons & Company, Limited, mechanical, hydraulic, and electrical engineers, of Bedford.

COLVILLES, LIMITED, has asked Lansing Bagnall, Limited, to supply a number of Towmotor trucks for its new Glasgow Clydebridge development. The diesel-powered Monarchs are for handling 10-ton billets of red-hot steel, between the slabbing mill and cooling bay.

AN ORDER HAS been received by the Dominion Bridge Company, Limited, structural and mechanical engineers, etc., of Montreal, Quebec, from the English Steel Rolling Mills Corporation, Limited, a subsidiary of the English Steel Corporation, Limited, for the supply of four cranes for its steelmaking complex being built at Sheffield.

AN ORDER VALUED at £260,000 has been received by Newton, Chambers & Company, Limited, Sheffield, from the East Pakistan Water and Power Development Authority, for 15 crawler-mounted draglines and three truck-mounted cranes. The machines are being purchased through a UK loan to the East Pakistan Government.

SWITCHGEAR DIVISION of Associated Electrical Industries, Limited, has received an order, worth about £250,000, in connection with a new sub-station at Aldwarke (Yorks). A further order, worth about £445,000, for switchgear for stations within the Edinburgh and borders area, has been placed by the South of Scotland Electricity Board.

CONTRACT WORTH £360,000 for the construction of a new reservoir to augment the supply to the Steel Company of Wales, Limited, plant at Port Talbot (Mon), has been awarded to Sir Robert McAlpine & Sons, Limited. The reservoir, which may later be deepened to hold 600,000,000 gallons, will be built on 370 acres of farmland at Margam.

A. G. WILD & COMPANY, LIMITED, manufacturers of mining and railway equipment, Sheffield, has received repeat orders from Belgium, Germany, and France for chain tensioning equipment for use with the modern type of armoured flexible chain conveyors in use at the coal face. Several hundred of the Wild units have been supplied to British collieries.

Mr. W. W. S. ROBERTSON, executive vice-chairman of the Bedford engineering firm of W. H. A. Robertson & Company, Limited, has returned after a fortnight in the Argentine with £900,000 worth of orders for machinery and equipment. There is an order for equipment worth £800,000 for a new rolling mill, with deliveries fixed for 1963, and an order for hot-rolling mill and wiredrawing equipment worth £100,000.

THREE ORDERS together worth £50,000 have been received by Brookhirst Igranic, Limited, a company in the Metal Industries, Limited, group. They are for crane controls for Nederlands Kabelfabrieken, NV, of Alblasserdam, Holland; 64 electro-magnetic brakes to Metallurgique d'Esperance-Longdoz for a new plant at Chertal, Belgium; and a switchboard for a paper mill in Russia, placed by the Harland Engineering Company, Limited.

GEORGE KENT, LIMITED, Luton, has received an order worth over £500,000 from the Midland Project Group of the Central Electricity Generating Board to supply instrumentation and automatic control equipment for the new Drakelow "C" power station in Derbyshire. The order is also under the instructions of the boilermakers, John Thompson Water Tube Boilers, Limited, and the English Electric Company, Limited, which are installing two boiler turbine units.

CONTRACTS TOTALLING nearly £150,000 in value have been obtained recently by the heavy plant division of Associated Electrical Industries, Limited, for large electric motors at home and overseas. One, received through Australian Electrical Industries Pty., Limited, is for motors for Broken Hill Pty., Limited, Whyalla, South Australia; another is from Svenska Esso, AB, through its main contractor, Fluor Engineering & Construction Company, Limited, and in the home market, the Billingham division of Imperial Chemical Industries, Limited, has placed a contract for three 5,000 h.p. synchronous motors for driving compressors.

Future Salesman Will Make On-the-Spot Decision

SPEAKING at the company's annual distribution of awards, Mr. S. Walker, chairman of Laycock Engineering, Limited, manufacturers of railway specialities, dropforgings, and stampings, etc., of Sheffield, said he saw the British salesman of the future—the Common Market salesman—as one who had technical training and knew at least two foreign languages because, "in meeting the growing competition he will have to be able to make decisions on the spot."

Referring to the growing emphasis on technical training, Mr. Walker went on, "In these difficult days of unconstitutional strikes, we hope that we will be able to produce honest-to-goodness engineers to take over management of companies, engineers who have been trained in the art of management."

Railway Wagon Building a Contracting Industry

PROFIT earned by the wagon building and engineering side of Charles Roberts & Company, Limited, Wakefield (Yorks), in the year to March 31, 1961, was much lower than in 1959-60, and for some years, says Mr. R. Bailey (chairman), it has been apparent that railway wagon building is a contracting, although not a dying industry.

Reorganization and replanning of the works is now practically completed and figures for the six months to September 30, 1961, show that the engineering side of the business traded profitably.

Company News

Hadfields—Escher Wyss Deal

60 PER CENT. OF MILLSPAUGH TRANSFERRED

OFFER of £1,260,000 by Escher Wyss, of Zurich, for 60 per cent. of the £600,000 ordinary capital of the board and paper making machinery manufacturing subsidiary, Millspaugh, Limited, has been accepted by the board of Hadfields, Limited. Hadfields will continue to hold one third of the Millspaugh stock, and will be represented on the board. As part of the agreement, Hadfields will receive the repayment from Millspaugh, within the next 12 months, of all the £1,260,232 outstanding balance of moneys loaned that company in recent years.

Sir Peter Roberts, chairman of Hadfields, in a letter to shareholders, explains that the problem of providing sufficient additional funds adequate to finance the development of both Hadfields and Millspaugh has been of concern to the board, and in the light of this the offer of Escher Wyss had been accepted. It is hoped that by combining the experience and know-how of the three groups that the future development of Millspaugh will be materially strengthened for the benefit of all the interested parties. Hadfields cash resources will be increased by about £2,400,000, but an overall capital loss of some £320,000 has to be borne, Sir Peter says.

In parallel with these negotiations, agreement has been reached, subject to Treasury approval, for the Black-Clawson Company, of the US, to purchase certain Canadian manufacturing interests which, so far as Millspaugh is concerned, have shown a bad past experience. Arrangements will be made for representation to be maintained in Canada by both Hadfields and Millspaugh. Overall, says Sir Peter, cash resources will be increased by £2,635,000 as a result of all the transactions.

WILKINSON SWORD COMPANY, LIMITED—A new international division has been formed to expand export business. Mr. R. J. Randolph, assistant managing director, will head the new division as executive director.

SMITH'S DOCK COMPANY, LIMITED, ship repairers, builders, and engineers, of North Shields—Trading profit recovered to £901,933 in the year ended September 30, 1961, from £784,300. The dividend is again 10 per cent. with a final of 6¼ per cent.

ASSOCIATED ENGINEERING, LIMITED—Net profit, after tax of £1,355,923 (£1,787,227), is down at £1,496,189 (£1,882,836). Final dividend is 8¼ per cent., making a 13¾ per cent. total. The same equivalent, adjusting for a 50 per cent. scrip issue, was paid last year.

BRIGHTSIDE ENGINEERING HOLDINGS, LIMITED—Group surplus of £1,011,502 in the year ended September 30, 1961, compares with £1,061,113, and after tax of £539,099 (£543,352), there is a net balance of £472,403 against £517,761. Dividend of 20 per cent. is repeated with a final of 15 per cent.

COVENTRY GAUGE & TOOL COMPANY, LIMITED—Group profits nearly doubled to a record £896,038 in the year ended August 31, 1961. After a tax of £403,298 (£174,438) the net profit was £402,209 (£219,721). The final dividend is raised by ¼d. to 7¼d. tax free per 10s. ordinary unit, making with the similar increase in the interim, a total of 10½d. net, against 9d. per unit. The total payment is on ordinary capital of £1,625,000 as increased by a one-for-four rights issue in January.

SENIOR ECONOMISERS, LIMITED—To some extent finance for the company's expansion plans can be met from its own resources, but £525,000 of new money is being raised by a rights issue. Ordinary holders of December 15 have the right to 4,200,000 1s. shares at 2s. 6d. each on a one-for-two basis.

STAVELEY INDUSTRIES, LIMITED—Mr. John P. Hunt, the chairman, assured shareholders that the board felt "fully justified" in maintaining the dividend. It could well be further maintained and possibly increased in the future, he said. Profits for the first four months of the current year compared "very well."

MIDLAND IRON GROUP (CRADLEY HEATH), LIMITED—Group profits for the year ended July 31, 1961, were £315,068 compared with £308,849, but after heavier tax of £157,679 (£135,964), the net balance was lower at £157,389 (£172,885). A final dividend of 30 per cent. makes 45 per cent. for the year, as previously.

ARTHUR LEE & SONS, LIMITED, makers of strip steel, wire rods, drawn bars, etc., of Sheffield—With trading profit down 20 per cent. to £1,316,990, after depreciation of £430,618, the total distribution is cut to 12 (13½) per cent. by reducing the bonus by 1½ points to 1 per cent. After taxation of £761,999 (£898,990), the net profit is £628,164 (£810,336).

WHITEHEAD IRON & STEEL COMPANY, LIMITED—The final dividend of 8½ per cent. for the year ended September 30, 1961, makes a total of 15 per cent. on capital doubled by a scrip issue. A similar equivalent was paid for 1959-60. Group profits contracted to £1,053,624 (£1,446,830) and, after tax of £565,298 (£715,683), the net balance is £488,326 (£731,147).

FAIRBAIRN LAWSON COMBE BARBOUR, LIMITED, textile machinery manufacturers, etc., of Leeds—The chairman, Mr. W. Walker, announces reorganization of capital, and proposals providing for converting the preference and preferred ordinary shares into cumulative preference. It is also intended to propose arrangements for additional finance to deal with expansion plans.

WOLVERHAMPTON DIE CASTING COMPANY, LIMITED—Trading conditions experienced during most of 1960-61 have not yet shown any sign of improvement, says Mr. W. C. Sproson, the chairman. Customer demand is at a very low ebb which, combined with the continued upward trend of all costs, "means that the current year will inevitably be a very difficult one."

MORGAN CRUCIBLE COMPANY, LIMITED—The company, which owns all the ordinary and £3,808 of the 6 per cent. preference capital of Ship Carbon Com-

pany of Great Britain, Limited, is offering to acquire the remaining £246,192 preference on the basis of an exchange of six of its 5 per cent. second £1 preference for every five Ship Carbon £1 units. The Ship Carbon board is recommending acceptance.

PLESSEY COMPANY, LIMITED, general engineers, and manufacturers of telephone, radio, and electronic instruments, etc., of Ilford (Essex)—Consolidated group profit for the year to June 30, 1961, was £4,049,794 (£4,300,884). Aimed specifically at the export market, Plessey International, Limited, has greatly expanded its design, development and tooling activities, says the chairman, Sir Allen Clark, and it looks forward to an increase in export orders as a result.

WOMBWELL FOUNDRY & ENGINEERING COMPANY, LIMITED—Trading profit for the year was down at £67,657 (£80,102) and, after tax, profit is £25,162 (£30,487). In common with other producers of iron and steel goods there has recently been a falling off in certain classes of the company's trade, says Mr. Joseph Richards, the chairman. "If we are unable to maintain full production the costs will go up, but we hope this will not materially affect our policy of maintaining our capital development scheme," he adds.

VICKERS-LIMITED—Negotiations are being completed for the acquisition of 60 per cent. of the equity of All Wheel Drive, Limited, Camberley (Surrey). The remaining 40 per cent. will be held by Clark Equipment International, Limited. All Wheel Drive manufactures in the UK the Clark Michigan range of construction machinery, some of which may in future be made by subsidiary and associated companies in the Vickers group. From January 1 the Michigan range of construction equipment will be sold and serviced throughout England and Wales, except Northumberland, Cumberland, Westmorland, and Durham, by Jack Olding & Company, Limited, a member of the Vickers group.

FAIRFIELD SHIPBUILDING & ENGINEERING COMPANY, LIMITED—Trading profits in the year ended June 30, 1961, contracted from the previous year's record figures to £578,833 (£1,043,781). For the third successive year the dividend is 20 per cent. on the £250,000 ordinary capital, of which 99 per cent. is privately held. Sir John Maxwell Erskine, the chairman, points out that in recent times there have been many broad generalizations as to the competence and attitude of those engaged in the industry, whether in management, or as operatives, which have served to denigrate the status of British shipbuilding in the eyes of the world. These generalizations are sometimes grossly unfair and serve to make even more difficult the ability of the industry to compete oversea. To our disadvantage, full use is made of such comment, he says.

Stewarts and Lloyds' £1,000,000 Office and Centre

LARGEST administrative office in the world within the international steel tube manufacturing group headed by Stewarts and Lloyds, Limited, Lloyd House, a new £1,000,000, 11-storey building in Birmingham, came into full operation on Thursday of last week. It represents a landmark in the 100 years' history of the parent company.

The new building houses the Midland sales and administrative staff of a concern which is among the leading steel tube manufacturers in the world. It will be the headquarters of certain sections of the company's work, the UK office of other departments, and the Midlands centre.

Big Response to New Exhibition Centre

IN the three months since it was announced that bookings were being accepted for exhibitors at the planned new headquarters of the Engineering and Building Centre, Birmingham, more than 320 firms have reserved space. Although the centre is not due to be opened until next March, advance bookings already account for more than a half of the 600 exhibition stands available.

Mr. Anthony J. Cox, general manager of the centre, said: "We are tremendously encouraged by the response. Bookings have come in from varying types of firms and many of our current exhibitors have made requests for display space in the new headquarters."

One of the objects of the centre is to provide visitors with a comprehensive selection of products in the particular branch of industry in which he is interested. The engineering part of the building, for example, is being divided into broad groups to include raw materials, castings of all types, boilerhouse plant, and equipment, factory plant, machinery, tools, and electrical gear.

The new centre, which has two halls, is specially designed to provide facilities for temporary as well as permanent exhibitions. It will also include active information bureaux, lecture halls with projection equipment, secretarial services, and catalogue libraries.

Turner & Newall to Join Arcon Group

THE Arcon Group is to be joined by Turner & Newall, Limited, while the Crittall Manufacturing Company, Limited, is to resign from the group and will be replaced by Henry Hope & Sons, Limited. Formed in 1943 to carry out research and development into building techniques and the use of new materials, the group now produces factory made structures for all types of construction and exports about 80 per cent. of production.

From January 1, the group will consist of Henry Hope & Sons; Imperial Chemical Industries, Limited; Stewarts and Lloyds, Limited; Taylor Woodrow (Building Exports), Limited; Turner & Newall; and the United Steel Companies, Limited. Group consultant is A. M. Gear & Associates. Turner Asbestos Cement, Limited, was one of the founder members of Arcon, but later resigned.

Outlook for Tube Investments

UNLESS there is a marked improvement in trade shortly, the company is unlikely to make a complete recovery this year from the reversals caused by Government financial policy, said Sir Ivan Stedeford, chairman of Tube Investments, Limited, at the annual meeting in Birmingham on Monday. In the latter event, it was unlikely that group results would be significantly different from 1959-60.

In 1959-60 net profits amounted to £8,100,000, compared with £9,300,000 in 1960-61. In both years the dividend was equivalent to 14 per cent. on the existing £35,340,000 capital.

Mr. WILLIAM G. FORREST, chief estimator for Lithgows, Limited, shipbuilders, of Port Glasgow, died recently, aged 61. He had been 46 years with the firm, joining them as an apprentice draughtsman.

NEWS IN BRIEF

THE purchasing and stores department of the North-Western Division of the NCB has moved from divisional headquarters in Portland Street, Manchester, to the NCB offices at Kirkless, near Wigan.

ACTUAL PRODUCTION of raw steel in the US during the week ended December 11 totalled 2,158,000 tons. This was a 4.1 per cent. increase compared with the 2,073,000 tons produced in the preceding week.

AN ORE CARRIER of 18,000 tons ordered from Austin & Pickersgill, Limited, Sunderland, by Welsh Ore Carriers, Limited, has been increased in size to 28,000 tons. It is understood that the owners may order a second ship.

LORD HAILSHAM, Minister of Science, visited the research establishment of Vickers, Limited, at Charters, Sunninghill, near Ascot, recently. He saw some of the current lines of work and talked to scientists and technicians engaged on various projects.

A SPECIAL TRAIN, the first of several planned, left Thornaby (Yorks) on Saturday for Edinburgh. It carried the first consignment of more than 500 pieces of steelwork produced by Head Wrightson Teesdale, Limited, for the new Forth road bridge.

DECISION TO USE aluminium lighting columns for street lighting has been rescinded by Middlesbrough Corporation Watch Committee. It was decided that as Middlesbrough is a steelmaking area, local industry should be supported by using steel columns.

SCIENTISTS from the British Shipbuilding Research Association will be on Britain's newest passenger liner —the 33,000-ton-gross Transvaal Castle—when she runs trials this month. They hope to obtain information which will help to advance the design of future ships.

SALES representation in the UK for the Churchill Machine Tool Company, Limited, a subsidiary of the Birmingham Small Arms Company, Limited, will from January 1, 1962, be carried out by Burton Griffiths & Company, Limited, Mackadown Lane, Kitts Green, Birmingham, 33.

A MEMORIAL FUND has been established in order to endow a bed in Peterborough Memorial Hospital, or for some other similar purpose, in memory of the late Mrs. Frank Perkins, whose husband founded the Peterborough diesel engine firm of F. Perkins, Limited, some 30 years ago.

NEW SUBSIDIARY, the Pollard Ball & Roller Bearing Corporation, New York, has been formed by the Pollard Ball & Roller Bearing Company, Limited, Knottingley (Yorks). Mr. J. L. King, chairman of the UK company, is president of the Corporation, whose resident director is Mr. F. W. Herlitz.

FROM JANUARY 1, the home sales department of Johnson & Phillips, Limited, manufacturing electrical engineers and cablemakers, of London, S.E.7, will operate a cable sales organization, dealing with cables and junction boxes, and a plant sales division, for switchgear, transformers, and capacitors.

CLOSE ASSOCIATION between Newcastle-upon-Tyne and the National Coal Board was undeflined on Wednesday when the city's Lord Mayor, Ald. Dr. Henry Russell, put through an inaugural telephone call to the NCB deputy chairman, Mr. E. H. Browne, in London, to initiate subscriber trunk dialling from the city.

SIMILAR TO that planned near Winchester (Hants), the Gas Council's second underground gas reservoir is likely to be in the North Riding of Yorkshire, where suitable rock formations have been found. Its capacity will be about 10,000,000,000 cu. ft. The Council hopes eventually to have about six underground gas reservoirs in England.

THE CHRISTMAS LECTURE for young people—"Joining the Modern Way"—which has been arranged by the Institute of Welding, will be given by a past president, Mr. John Strong. It will be held at the institute's headquarters, 54, Princes Gate, Exhibition Road, South Kensington, S.W.7, on Thursday, January 4, at 11 a.m. Admission is by ticket only.

MARKETING AND PRODUCING for profit, control of overheads, and effective management of assets will be discussed at a British Institute of Management one-day conference on "Planning for Maximum Profits," to be held at the Connaught Rooms, London, W.C.2, on January 11. It is intended for directors, senior managers, and accountants.

TO STREAMLINE operations on the Continent, Lansing Bagnall, Limited, manufacturers of battery electric fork lift trucks and industrial tractors, has formed a new company—Lansing Bagnall International, Limited. The new company will co-ordinate all European trading and the work of Lansing Bagnall, AG, Zurich, which services and sells trucks in Switzerland.

FIVE FIRMS, the site shotblasting division of R. J. Richardson & Sons, Limited, Birmingham, three painting contractors, and a paint manufacturer, have contributed to the formation of the Site Blasting & Painting Company, Limited, Birmingham, a new company which will undertake the cleaning and coating of metal surfaces on site. Chairman of the board will be Mr. G. E. Lunt, deputy chairman of R. J. Richardson & Sons, and a director of Staveley Industries, Limited.

SCOTTISH trade delegation has returned from Poland with a substantial number of inquiries for engineering products, including complete chemical plants, mining, and steel equipment. The delegation, sponsored by the Scottish Council (Development and Industry), and representing six Scottish engineering firms, investigated opportunities for building complete plant on a consortium basis. The delegation also reports interest in machine tools, textile plant, and chemical handling equipment.

WITH THE reorganization of Small & Parkes, Limited, engine packing, textile belting, and brake lining manufacturers, new appointments will come into effect on January 1, states the Cape Asbestos Company, Limited. Mr. G. H. F. Parkes will be in charge of industrial division sales; Mr. E. J. Parsons, automotive sales, UK; and Mr. P. Worledge, oversea licensing and manufacturing and specific selling projects in the UK. These three, together with Mr. H. Middlehurst, export manager, will be responsible to Mr. A. H. Parkes, managing director, for all commercial activities.

Killed by Ventilation Duct

VERDICT of Accidental Death was recorded at a Newport (Mon) inquest on Mr. Marian Biedka, a crane driver, employed by Guest, Keen & Nettlefolds (Cwmbran), Limited, who was killed when a ventilation duct fell from the roof of the works on to his head.

Mr. Royston Fisher, chief engineer at the works, said that the duct carried dust and lead shot out of a foundry into a wet filter. When it had fallen it was found that 3 tons 2 cwt. of dust and shot had built up in the duct.

Law Cases

Bolt and Nut Pact: Registrar Loses Appeal

DECISION of the Restrictive Practices Court that a price agreement covering members of the Black Bolt and Nut Association of Great Britain should not be declared void was upheld in the Court of Appeal last week. The court dismissed an appeal by the Registrar of Restrictive Trading Agreements, who had claimed that the agreement, of June 29, 1961, was "of like effect" to an earlier one which the Restrictive Practices Court decided in July, 1960, to be contrary to the public interest in respect of some of its terms.

By the earlier agreement, a distinction was drawn between supplies of goods to Government departments and other large users, and ordinary supplies. The Restrictive Practices Court last year held that it was not contrary to the public interest that ordinary supplies had to be sold by members at fixed prices contained in the association's price list, but took an adverse view of the restriction that supplies for large users must not be sold below a minimum price notified to members, and declared it void.

Lord Evershed, Master of the Rolls, said he considered an agreement "of like effect" was one which would have to operate in the same way substantially as the original agreement. He did not think it did. It was not for the court to investigate the real effect of the new agreement.

Lord Justices Willmer and Danckwerts agreed that the appeal should be dismissed with costs. Leave to appeal to the House of Lords was refused.

"Price Cutting" Warning in Magnets Case

IF the price agreement of the Permanent Magnet Association was ended, price cutting was almost bound to occur in some parts of the trade, Mr. A. G. Stanley, a director of Darwins, Limited, told the Restrictive Practices Court on Monday. Mr. Stanley, who is responsible for Darwins' production and sale of permanent magnets, said the effect would depend on trade conditions at the time.

The Court, which has to decide whether the agreement is in the public interest, was earlier told by Mr. F. W. Tetley, a director of Swift Levick & Sons, Limited, Sheffield, that the magnet industry in Britain was as efficient as any other. The association's co-operative system of research prevented duplication of work, and saved companies' time and money.

Sir Frank Soskice, QC, opening the case for the Registrar of Restrictive Trading Agreements, submitted that the association had not shown that magnets were made available more cheaply. What had been shown conclusively was that, if it were not for "this price ring," magnets would be made far more cheaply.

JURY SITTING WITH Lord Migdale in the Court of Session awarded damages of £2,800 to Mr. George Robertson (40), a crane driver, who met with an accident while employed by Babcock & Wilcox, Limited, Renfrew.

AT GLAMORGAN ASSIZES, Mr. Justice Thompson deferred judgment on a claim for damages made by Mr. Thomas Idwal Davies (61), against the National Coal Board, for injuries received at Pantyffynnon Colliery, near Ammanford (Carms), in April, 1958.

Trial Rollings Start at New Steel Mill

TECHNIQUES of the new cold reduction steel strip mill at Gartcosh, part of the £83,000,000 development scheme at the Glasgow works of Colvilles, Limited, are new to Scottish workers, and trial rollings were started this week. As the mill is run in, commercial orders will be tackled, and among the first of these will be the rolling of 60,000 tons of Russian steel. The first 5,000 tons is due for delivery to Russia next month.

The mill is operated by Smith & McLean, Limited, Glasgow, a subsidiary of Colvilles, and will finish hot-rolled coils from the semi-continuous strip mill at Ravenscraig, eight miles away, which is planned to be in production next autumn. In the meantime coils for Gartcosh will be brought from existing strip mills in the South. The present consumption of steel sheet in Scotland is a little more than 100,000 tons a year, but the needs of Scottish industry are greatly in excess of this.

To meet the expected growth of demand the Gartcosh mill's planned capacity has been raised from 230,000 tons to 500,000 tons a year. It is capable of rolling strip between 28 in. and 62 in. wide in coils weighing up to 61,000 lb.

Firth Cleveland Group's Profits Outlook

WHILE trading profits for 1961 of the Firth Cleveland, Limited, group, will not reach the 1960 record, Mr. C. W. Hayward, chairman, believes they will be satisfactory having regard to the tougher conditions faced. The recession among makers of cars, radio, television, and domestic appliances has had its effect on trading, particularly in the engineering and steel divisions. In certain sections this still persists, but the recent improvement in the motor industry has been reflected by an improvement in order-books.

Mr. Hayward says the group has just bought and is now in a position to exploit the Firth Cleveland Laing tangential fan patents throughout the world, in addition to the UK rights. Already some 750,000 fan components have been manufactured in Europe, and the ultimate potential will be considerable.

GKN OFFER FOR RALEIGH WORKS

AN offer has been made by Guest, Keen & Nettlefolds, Limited, through its subsidiary, G.K.N. Group Services, Limited, to purchase the Lion works, at Newtown (Montgomery), from Raleigh Industries, Limited. Subject to the completion of contract arrangements, the deal is likely to be concluded early next year. Raleigh announced in June that it had decided to close down the factory at the end of this year.

Present intentions, state GKN, are to establish at the factory additional manufacturing facilities and every effort will be made to offer, in due course, employment to the maximum number of persons.

CONSTRUCTED IN Edinburgh by Bruce Peebles & Company, Limited, a 190-ton transformer—the largest ever built for a Scottish power station—has arrived at Kincardine after a road and sea journey of about 600 miles.

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ARBED's Contribution to European Steel

WITH the group's production representing some 60 per cent. of Luxembourg's entire output of steel, Aciéries Réunies de Burbach Eich Dudelange (ARBED) last year manufactured 3,206,000 metric tons of ingot steel. This figure is equal to half the production of Belgium or Italy, 20 per cent. of the French production, or 4.4 per cent. of the whole Common Market steel output. Compared with 1937, the group's steel output has increased by 40 per cent., while the proportion of semi-products in the entire production has fallen to 3 (12) per cent. and that of flat products has risen to 35 (15) per cent.

Among the additions to Arbed's equipment now under construction are six foundries, a lime kiln, four slag mills, two slag brickworks, and a power plant. Last year the concern put new convertors into service at its Burbach steelworks and a new cold rolling mill for strip at its Dudelange unit. Other expansions are going on and this year new rolling mills will come into service at the Esch works and a fourth sintering unit will begin to operate in the Belval plant.

Next year the power plants of Esch and Burbach will be enlarged and a fourth blast furnace and a new convertor of 50 tons using oxygen will be ready to operate at the Dudelange works. While the modernization and expansion process is going on in the Arbed steelworks, the group is preparing, in conjunction with the Schneider concern and the Belgian steel undertakings Cockerill-Ougrée and Forges de la Providence, for the erection of an integrated steelworks in Zelzaete, Flanders.

This new venture, known under the name of "Sidemar," will have initially an annual capacity of 1,000,000 to 1,500,000 metric tons of steel and ultimately the capacity will reach about 3,000,000 tons.

VITAL SKILL FOR TECHNICAL SKILL—LORD HAILSHAM

REFERRING to the British steel industry in a speech at the British Steel Founders' Association dinner in London on Thursday of last week, Lord Hailsham, Lord President of the Council, and Minister of Science, said that if we were to survive, we must remain technologically the leaders. "We are living in a world in which the very survival of our nation is at stake."

He went on: "I do not know what the formula for our survival may be, but I do know that one part of it, one ingredient, is that we should use the brains and skills we have to remain competitive in a technological and scientific world."

Shipbuilders Must Offer Substantial Credit Terms

UNLESS substantial credit terms can be offered it is a waste of time tendering for new tonnage. This is the conclusion arrived at by Col. R. A. Bartram, chairman of Bartram & Sons, Limited, shipbuilders, etc., of Sunderland, who has just returned from a three-month order-seeking visit to the Far East.

Col. Bartram, who is chairman of the Wear Shipbuilders' Association, said that almost the first question he was asked by shipowners in Hongkong and elsewhere concerned the nature and availability of credit terms.

Increases of Capital

DOWTY GROUP, LIMITED, Cheltenham, increased by £500,000 in 10s. shares, beyond the registered capital of £6,000,000.

COATED METALS, LIMITED, London, E.C.2, increased by £70,000 in £1 ordinary shares, beyond the registered capital of £30,000.

HAYES ENGINEERS (LEEDS), LIMITED, Leeds, increased by £35,000 in £1 ordinary shares, beyond the registered capital of £15,000.

KIRKSTALL FORGE ENGINEERING, LIMITED, Leeds, increased by £750,000 in 5s. ordinary shares, beyond the registered capital of £1,250,000.

BEDCO, LIMITED, ironfounders, etc., of Harpenden, increased by £14,000 in £1 ordinary shares, beyond the registered capital of £16,000.

INCANDESCENT HEAT COMPANY, LIMITED, Smethwick, increased by £160,000 in 4s. ordinary shares, beyond the registered capital of £500,000.

HARGREAVES COAL & SHIPPING, LIMITED, London, E.C.3, increased by £50,000 in £1 ordinary shares, beyond the registered capital of £75,000.

TEMPERSET, LIMITED, ironmasters, etc., of West Bromwich, increased by £35,000 in £1 ordinary shares, beyond the registered capital of £40,000.

FOLLSAIN, LIMITED, smelters, ironmasters, etc., of Rugby, increased by £45,000 in 4s. ordinary shares, beyond the registered capital of £355,000.

RELIANCE FOUNDRY & ENGINEERING COMPANY, LIMITED, London, S.E.14, increased by £38,000 in £1 shares, beyond the registered capital of £12,000.

BROCKMOOR FOUNDRY COMPANY, LIMITED, Brierley Hill (Staffs), increased by £10,000 in £1 preference shares, beyond the registered capital of £60,000.

HARPER ENGINEERING & ELECTRONICS, LIMITED, London, E.C.2, increased by £1,250,000 in 1s. ordinary shares, beyond the registered capital of £1,250,000.

WHITEHEAD IRON & STEEL COMPANY, LIMITED, Newport (Mon), increased by £1,000,000 in £1 ordinary shares, beyond the registered capital of £2,000,000.

FREEMAN MORRISON, LIMITED, engineers, etc., of Newcastle-upon-Tyne, increased by £40,000 in £1 ordinary shares, beyond the registered capital of £40,000.

TONKS (BIRMINGHAM), LIMITED, brassfounders, etc., of Birmingham, increased by £100,000 in 5s. unclassified shares, beyond the registered capital of £200,000.

HAYES SHELL-CAST, LIMITED, iron and steel manufacturers, etc., of Birmingham, increased by £29,000 in £1 ordinary shares, beyond the registered capital of £1,000.

HENRY ROSSELL & COMPANY, LIMITED, manufacturers of iron, etc., of Sheffield, increased by £15,000 in 2s. ordinary shares, beyond the registered capital of £75,000.

J. & H. B. JACKSON, LIMITED, scrap-metal merchants, etc., of Coventry, increased by £100,000 in 1s. ordinary shares, beyond the registered capital of £100,000.

E. A. BROUGH & COMPANY, LIMITED, iron and sheet metal workers, etc., of Liverpool, increased by £140,000 in £1 ordinary shares, beyond the registered capital of £20,000.

ISAAC ROBSON & COMPANY, LIMITED, iron and steel merchants, etc., of Stockton-on-Tees, increased by £30,000 in £1 ordinary shares, beyond the registered capital of £20,000.

W. E. HUGHES & COMPANY, LIMITED, tinplate and metal merchants, etc., of London, E.C.2, increased by £30,000 in £1 ordinary shares, beyond the registered capital of £20,000.

GEORGE JOWITT & SONS (SALES), LIMITED, manufacturers of and dealers in abrasive materials, etc., of Sheffield, increased by £75,000 in £1 ordinary shares, beyond the registered capital of £50,000.

WARNER SWASEY ASQUITH, LIMITED, machine-tool manufacturers, etc., of Halifax, increased by £350,000 in 175,000 "A" and 175,000 "B" shares of £1 each, beyond the registered capital of £650,000.

LANDIS MACHINE-MAIDEN, LIMITED, founders, engineers, etc., of Hyde (Ches), increased by £100,000 in 80,000 "A" ordinary and 20,000 "B" ordinary shares of £1 each, beyond the registered capital of £100,000.

H. J. BARLOW & COMPANY, LIMITED, manufacturers of bright drawn steel and bright bolts and nuts, etc., of Wednesbury, increased by £125,000 in 2s. ordinary shares, beyond the registered capital of £75,000.

WILLIAM BOBY & COMPANY, LIMITED, water purification engineers, etc., of Rickmansworth, increased by £19,000 in 18,000 ordinary shares, and 1,000 "A" ordinary shares of £1, beyond the registered capital of £21,000.

JAMES FLORSHEIM & COMPANY, LIMITED, dealers in metals, machinery, plant tools, etc., of London, W.1, increased by £25,000, in 15,000 ordinary and 10,000 employee shares of £1 each, beyond the registered capital of £5,000.

GREENWOOD & BATLEY, LIMITED, engineers and machine makers, etc., of London, W.C.2, increased by £410,262 in 342,195 ordinary and 68,067 unclassified shares of £1 each, beyond the registered capital of £589,738.

F. PARKIN & SONS, LIMITED, iron and brass founders, engineers, etc., of Exeter, increased by £15,000 in 13,061 7 per cent. cumulative preference, 491 ordinary and 848 unclassified shares of £1 each, beyond the registered capital of £20,000.

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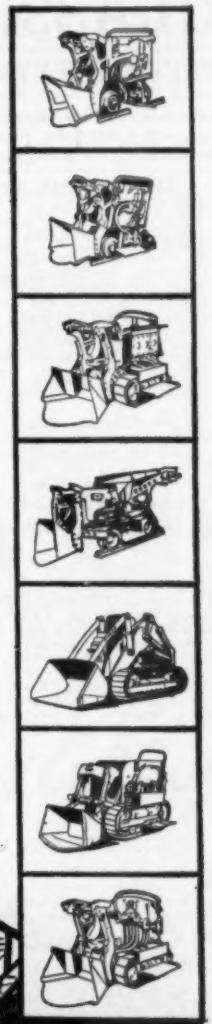

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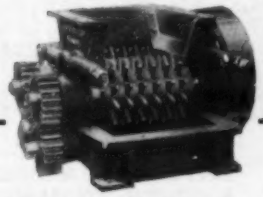

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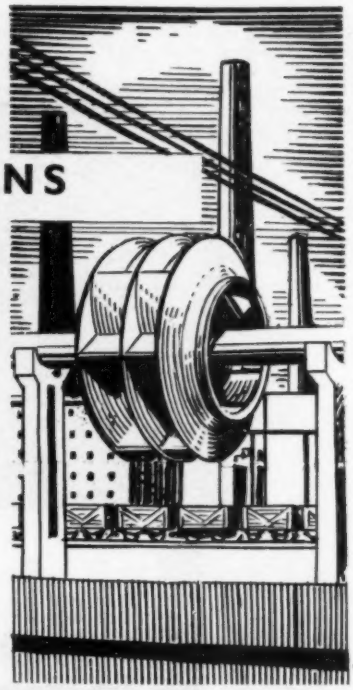

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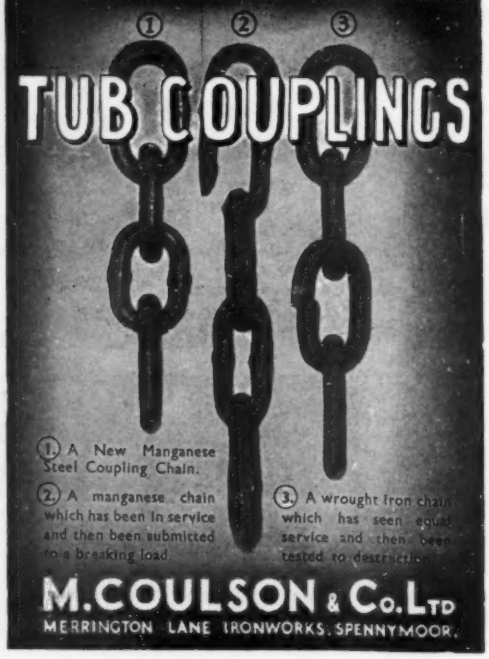
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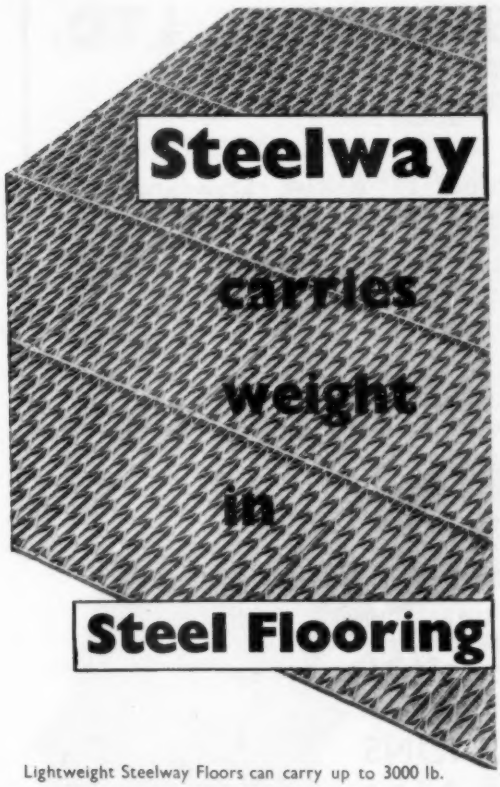

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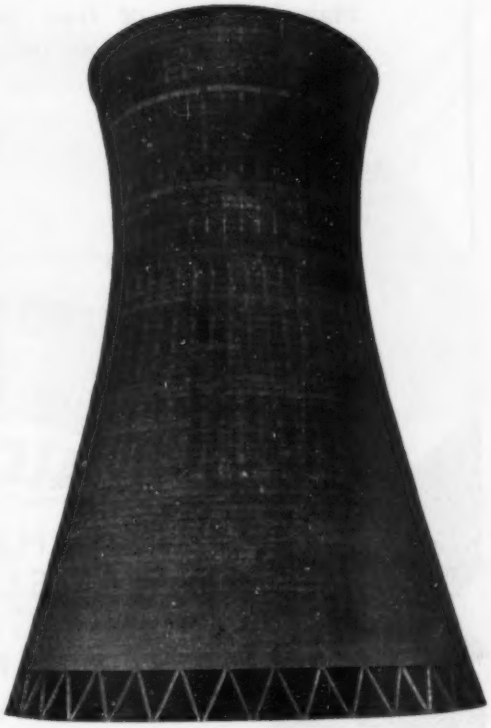

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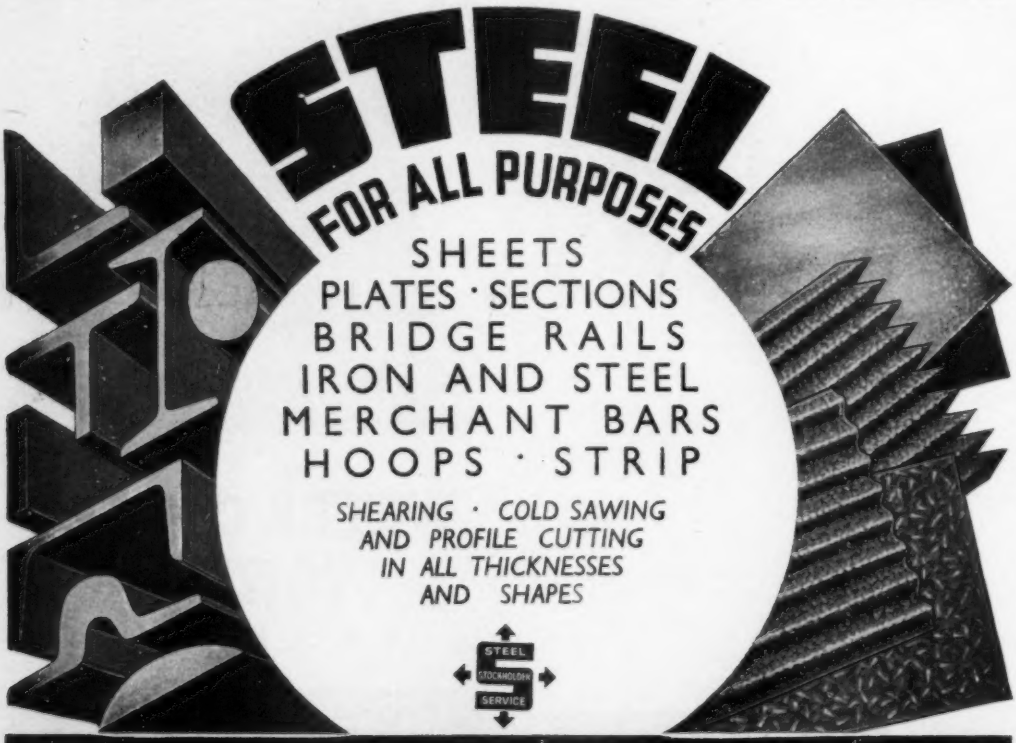

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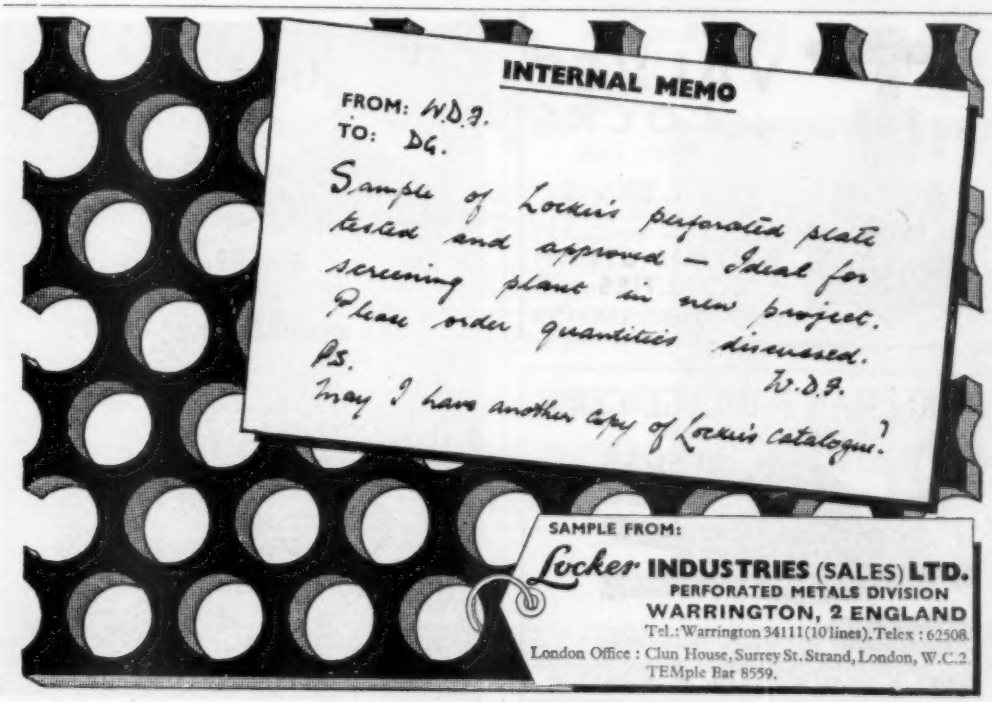
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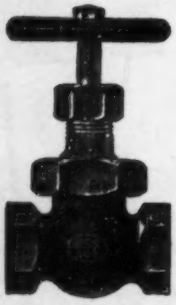

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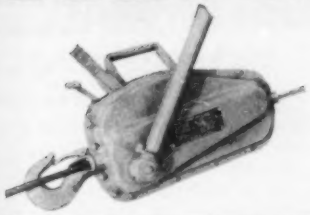

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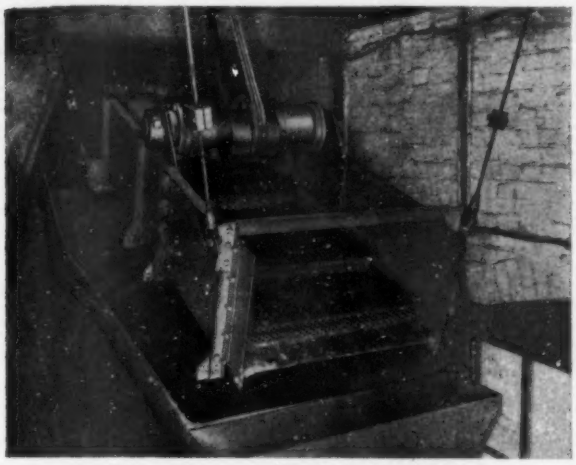

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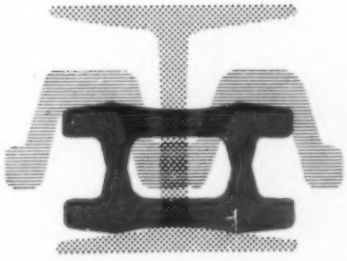

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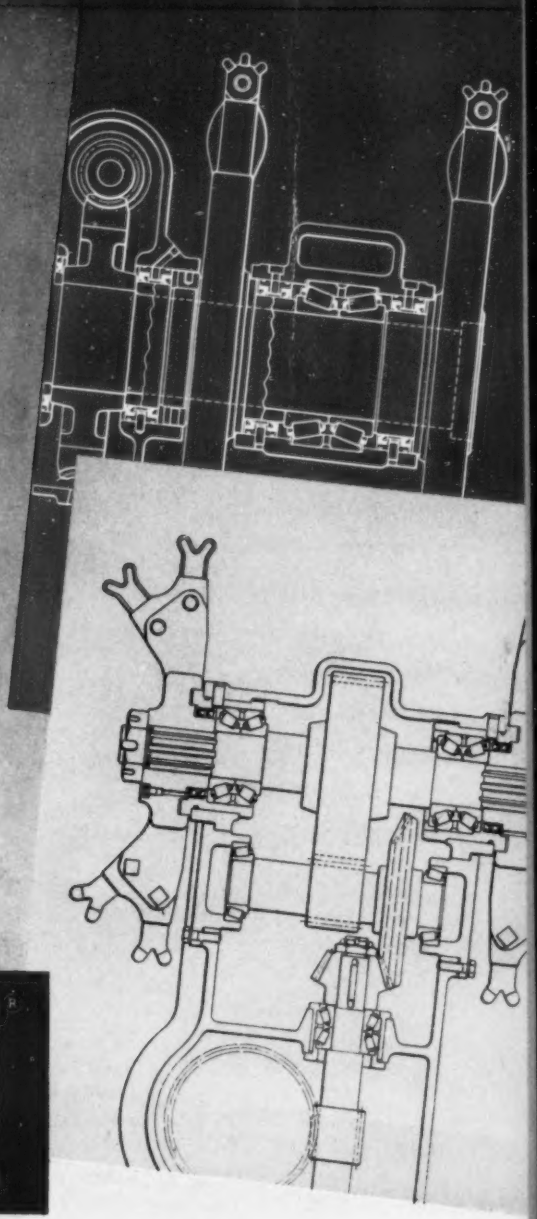

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